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APPLE COLOR PLOTTER TECHNICAL PROCEDURES

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Section 3. Take-apart (continued)

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Apple Color Plotter Technical Procedures

Section 1

Troubleshooting

Contents:

For these procedures you will need:

- Plotter test diskette
- Medium phillips screwdriver
- Medium flatblade screwdriver
- Allen wrench
- 5.5 mm nutdriver
- Tape

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Introduction

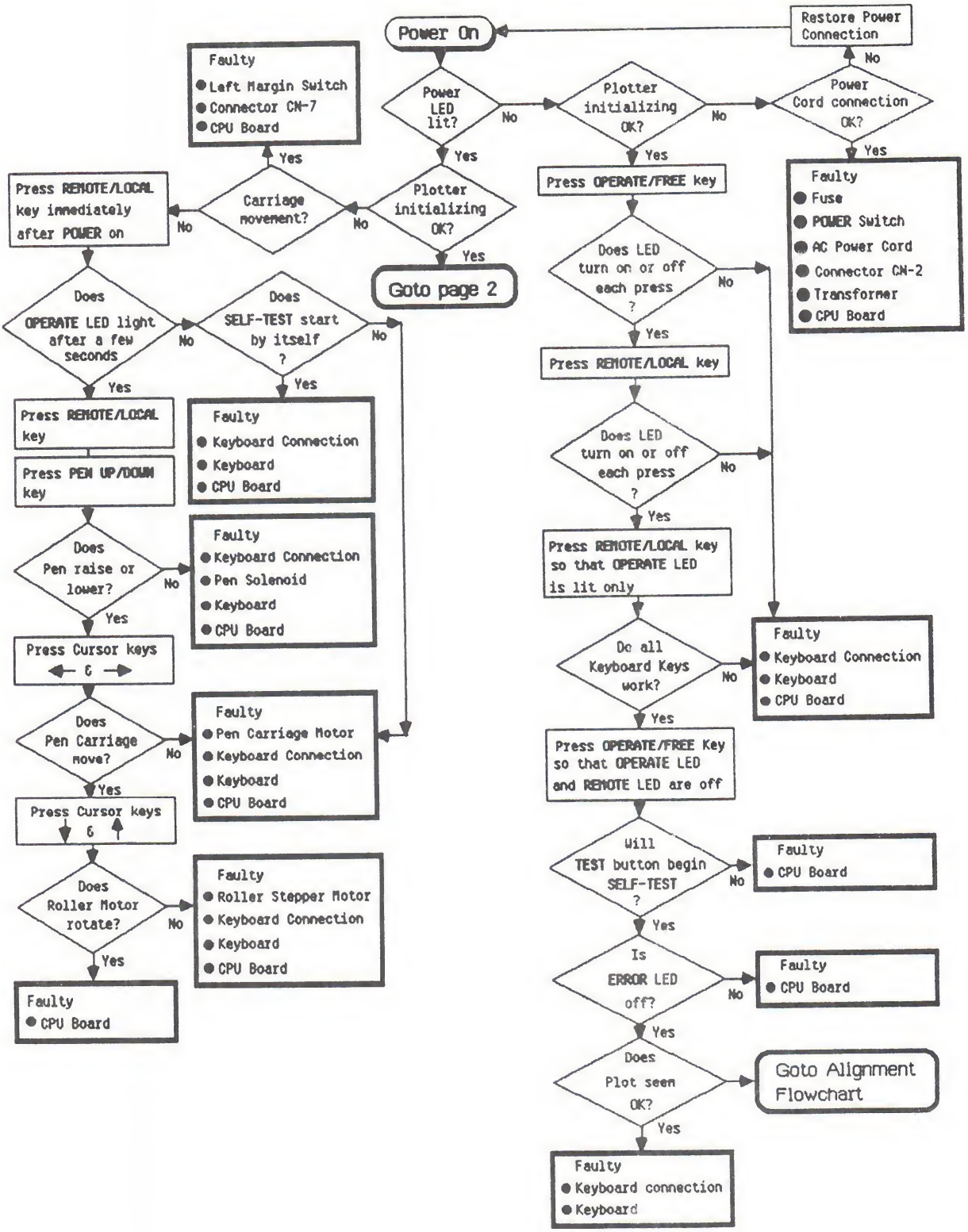
The troubleshooting flowchart is largely self explanatory. Refer to the take-apart section of these procedures if you need instruction on how to remove, replace, and adjust modules.

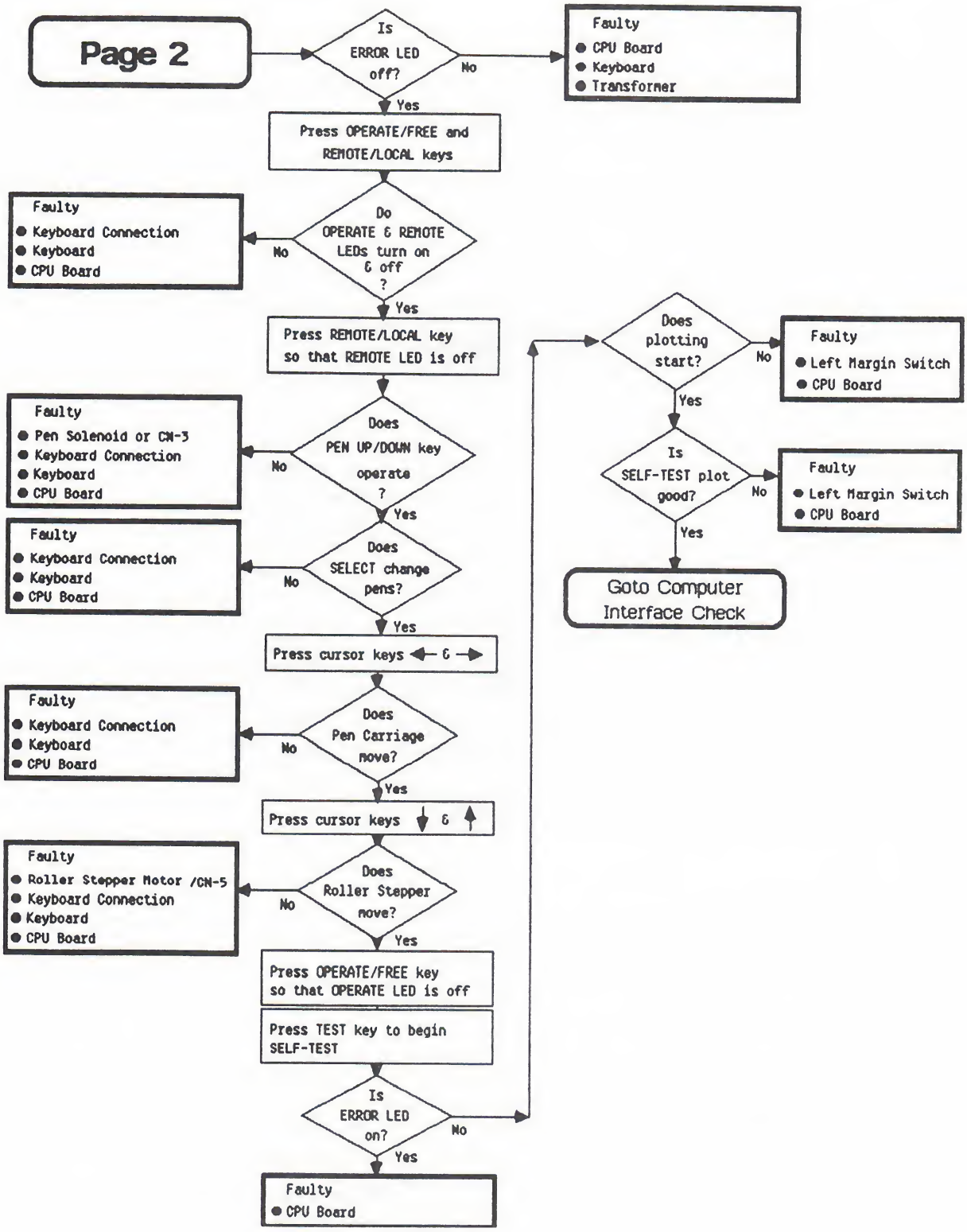
A few terms that are used in the flowchart may need clarification.

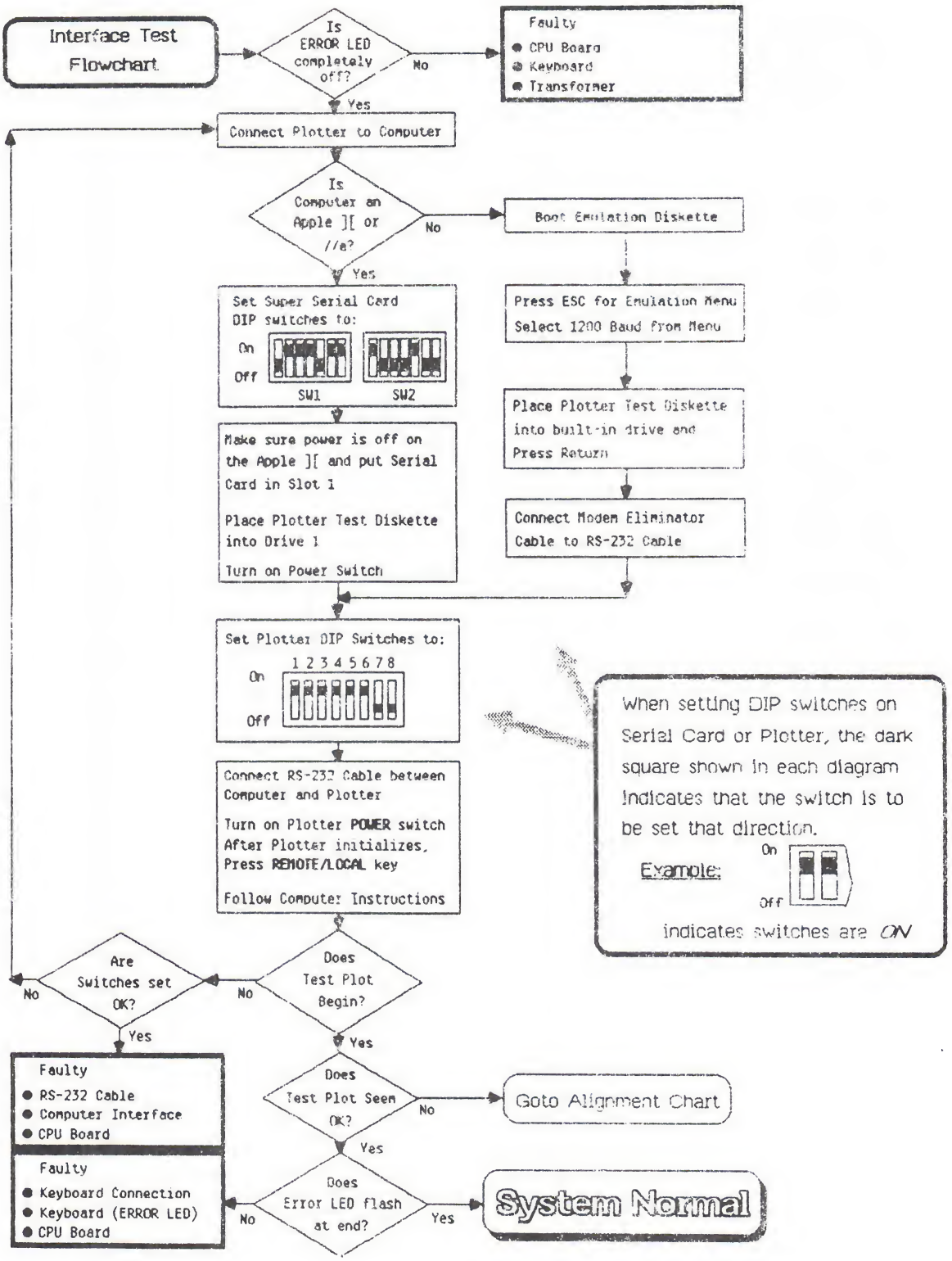
Plotter Initialization - After powering-up the plotter, the pen carriage travels to the left and rotates several times until pen number 1 is pointing down.

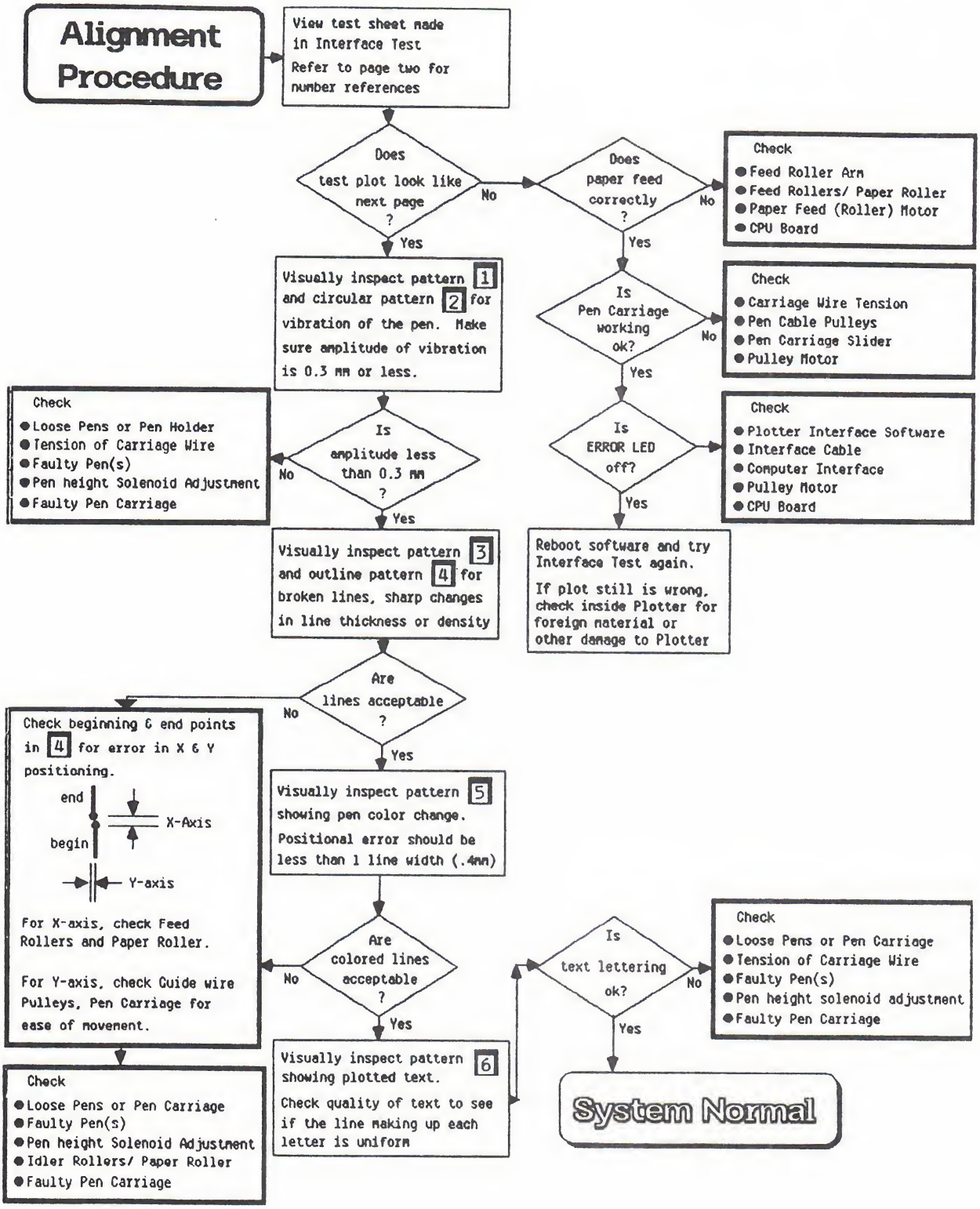
Self-Test - After power-up and initialization, press the test button on the plotter keyboard. The plotter is reinitialized, and then draws a self-test pattern.

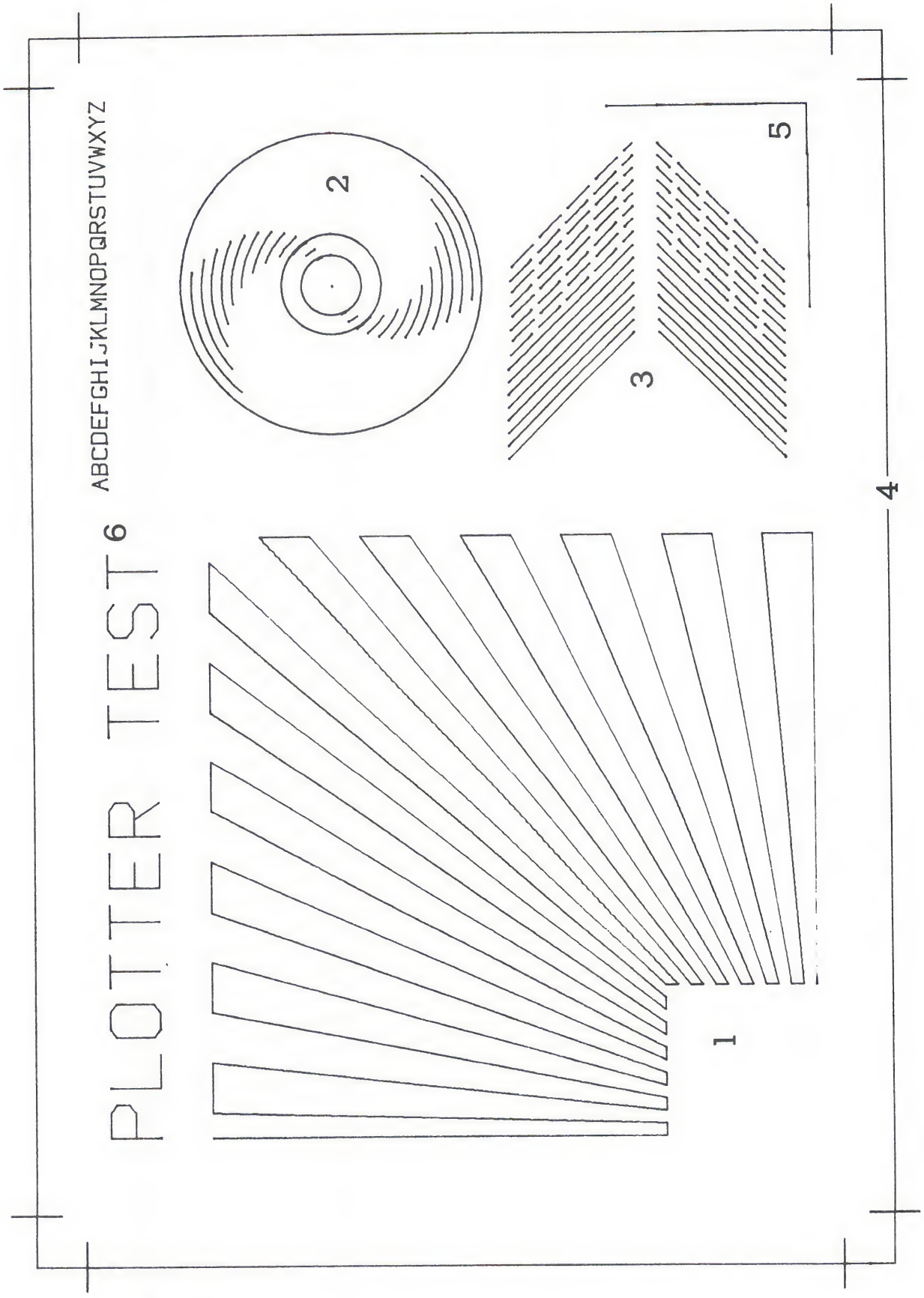
Names of parts and their location can be found in the Exploded Diagram and Parts List (Section 4 of these procedures).

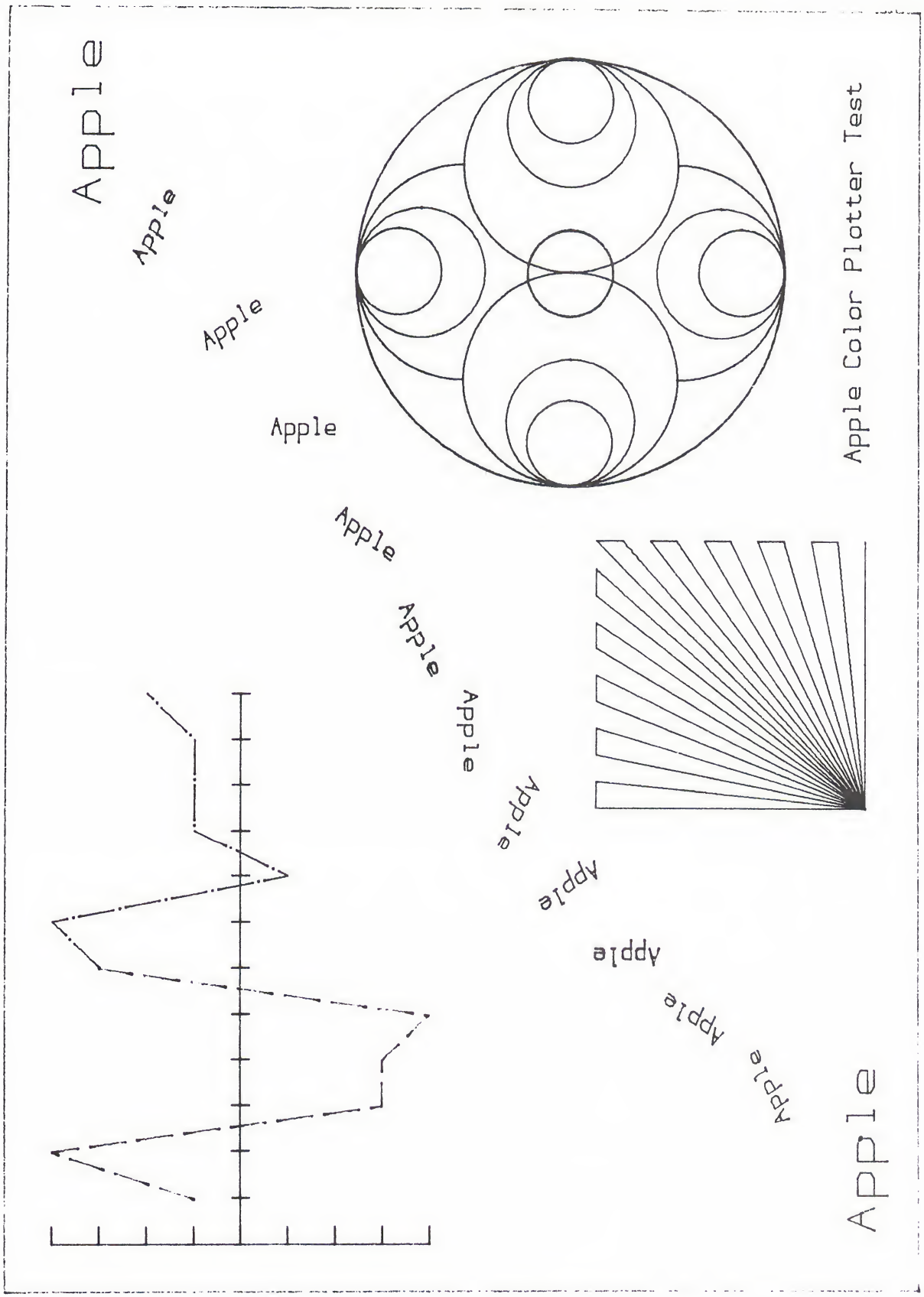

Power On
Power LED lit?
No
Yes
Faulty
Left Margin Switch
Connector CN-7
CPU Board
Plotter initializing OK?
No
Yes
Restore Power Connection
Power Cord connection OK?
No
Yes
Faulty
Fuse
POWER Switch
AC Power Cord
Connector CN-2
Transformer
CPU Board
Press OPERATE/FREE key
Does LED turn on or off each press ?
No
Yes
Press REMOTE/LOCAL key
Does LED turn on or off each press ?
No
Yes
Press REMOTE/LOCAL key so that OPERATE LED is lit only
Do all Keyboard Keys work?
No
Yes
Faulty
Keyboard Connection
Keyboard
CPU Board
Press OPERATE/FREE Key so that OPERATE LED and REMOTE LED are off
Will TEST button begin SELF-TEST ?
No
Yes
Faulty
CPU Board
Is ERROR LED off?
No
Yes
Faulty
CPU Board
Does Plot seen OK?
Yes
Goto Alignment Flowchart
Faulty
Keyboard connection
Keyboard
Plotter initializing OK?
No
Yes
Goto page 2
Carriage movement?
No
Yes
Press REMOTE/LOCAL key immediately after POWER on
Does OPERATE LED light after a few seconds
No
Yes
Press REMOTE/LOCAL key
Press PEN UP/DOWN key
Does Pen raise or lower?
No
Yes
Faulty
Keyboard Connection
Pen Solenoid
Keyboard
CPU Board
Press Cursor keys
Does Pen Carriage move?
No
Yes
Faulty
Pen Carriage Motor
Keyboard Connection
Keyboard
CPU Board
Press Cursor keys
Does Roller Motor rotate?
No
Yes
Faulty
Roller Stepper Motor
Keyboard Connection
Keyboard
CPU Board
Faulty
CPU Board
Does SELF-TEST start by itself ?
No
Yes
Faulty
Keyboard Connection
Keyboard
CPU Board


Page 2
Is ERROR LED off?
No
Faulty
CPU Board
Keyboard
Transformer
Yes
Press OPERATE/FREE and REMOTE/LOCAL keys
Do OPERATE & REMOTE LEDs turn on & off ?
No
Faulty
Keyboard Connection
Keyboard
CPU Board
Yes
Press REMOTE/LOCAL key so that REMOTE LED is off
Does PEN UP/DOWN key operate ?
No
Faulty
Pen Solenoid or CN-3
Keyboard Connection
Keyboard
CPU Board
Yes
Does SELECT change pens?
No
Faulty
Keyboard Connection
Keyboard
CPU Board
Yes
Press cursor keys ← & →
Does Pen Carriage move?
No
Faulty
Keyboard Connection
Keyboard
CPU Board
Yes
Press cursor keys ↓ & ↑
Does Roller Stepper move?
No
Faulty
Roller Stepper Motor /CN-5
Keyboard Connection
Keyboard
CPU Board
Yes
Press OPERATE/FREE key so that OPERATE LED is off
Press TEST key to begin SELF-TEST
Is ERROR LED on?
No
Yes
Faulty
CPU Board
Does plotting start?
No
Faulty
Left Margin Switch
CPU Board
Yes
Is SELF-TEST plot good?
No
Faulty
Left Margin Switch
CPU Board
Yes
Goto Computer Interface Check


Interface Test Flowchart
Is ERROR LED completely off?
No
Faulty
CPU Board
Keyboard
Transformer
Yes
Connect Plotter to Computer
Is Computer an Apple][or //e?
No
Boot Emulation Diskette
Yes
Set Super Serial Card DIP switches to:
On
Off
SW1
SW2
Press ESC for Emulation Menu
Select 1200 Baud from Menu
Place Plotter Test Diskette into built-in drive and Press Return
Make sure power is off on the Apple][and put Serial Card in Slot 1
Place Plotter Test Diskette into Drive 1
Turn on Power Switch
Connect Modem Eliminator Cable to RS-232 Cable
Set Plotter DIP Switches to:
1 2 3 4 5 6 7 8
On
Off
When setting DIP switches on Serial Card or Plotter, the dark square shown in each diagram indicates that the switch is to be set that direction.
Example:
On
Off
indicates switches are ON
Connect RS-232 Cable between Computer and Plotter
Turn on Plotter POWER switch
After Plotter initializes, Press REMOTE/LOCAL key
Follow Computer Instructions
Are Switches set OK?
No
Does Test Plot Begin?
No
Yes
Yes
Faulty
RS-232 Cable
Computer Interface
CPU Board
Does Test Plot Seem OK?
No
Goto Alignment Chart
Yes
Faulty
Keyboard Connection
Keyboard (ERROR LED)
CPU Board
Does Error LED flash at end?
No
Yes
System Normal


Alignment Procedure
View test sheet made in Interface Test
Refer to page two for number references
Does test plot look like next page ?
No
Yes
Does paper feed correctly ?
No
Yes
Check
Feed Roller Arm
Feed Rollers/ Paper Roller
Paper Feed (Roller) Motor
CPU Board
Visually inspect pattern 1 and circular pattern 2 for vibration of the pen. Make sure amplitude of vibration is 0.3 mm or less.
Is Pen Carriage working ok?
No
Yes
Check
Carriage Wire Tension
Pen Cable Pulleys
Pen Carriage Slider
Pulley Motor
Check
Loose Pens or Pen Holder
Tension of Carriage Wire
Faulty Pen(s)
Pen height Solenoid Adjustment
Faulty Pen Carriage
Is amplitude less than 0.3 mm ?
No
Yes
Is ERROR LED off?
Yes
Check
Plotter Interface Software
Interface Cable
Computer Interface
Pulley Motor
CPU Board
Visually inspect pattern 3 and outline pattern 4 for broken lines, sharp changes in line thickness or density
Reboot software and try Interface Test again.
If plot still is wrong, check inside Plotter for foreign material or other damage to Plotter
Are lines acceptable ?
No
Yes
Check beginning & end points in 4 for error in X & Y positioning.
end
begin
X-Axis
Y-axis
For X-axis, check Feed Rollers and Paper Roller.
For Y-axis, check Guide wire Pulleys, Pen Carriage for ease of movement.
Visually inspect pattern 5 showing pen color change. Positional error should be less than 1 line width (.4mm)
Are colored lines acceptable ?
No
Yes
Check
Loose Pens or Pen Carriage
Faulty Pen(s)
Pen height Solenoid Adjustment
Idler Rollers/ Paper Roller
Faulty Pen Carriage
Visually inspect pattern 6 showing plotted text.
Check quality of text to see if the line making up each letter is uniform
Is text lettering ok?
No
Yes
Check
Loose Pens or Pen Carriage
Tension of Carriage Wire
Faulty Pen(s)
Pen height solenoid adjustment
Faulty Pen Carriage
System Normal


PLOTTER TEST 6
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1
2
3
4
5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Apple Color Plotter Test
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Apple Color Plotter

Section 2

Setup and Configuration

Contents:

For these procedures you will need:

- Apple Color Plotter
- Apple computer with monitor and power cable
  - If you are attaching an Apple //e,][+, or][you will need a serial port card
  - If you are attaching an Apple /// you will need an Apple][Emulation diskette
- Apple Color Plotter test diskette
- Plotter power cable
- RS232 cable
- Modem eliminator cable
- Small flatblade screwdriver

Introduction

Refer to Section 4, Exploded Diagram and Parts List, if you need assistance locating the parts referred to below.

There are a few things you must remember to do when you are setting up the plotter for a customer.

1. Use the modem eliminator cable as well as the RS232 cable to connect the plotter to an Apple.

2. Verify the setting of the plotter DIP switches. (Although the User's Guide says the plotter will be shipped with the switches set correctly, it is possible that they will not be correct.)

3. Boot the plotter test diskette to see that the computer communicates successfully with the plotter.

Below you will find brief instructions outlining these procedures.

Beware: The Apple /// and the Apple][computers have slightly different procedures. Be sure to read the notes (in each section below) which describe these differences.

Hooking up the Plotter

1. Connect the "female" end of the modem eliminator cable (the shorter of the two cables you received with the color plotter) to one of the ends of the RS232 cable.

2. Tighten the screws that come with the cables to secure the connection.

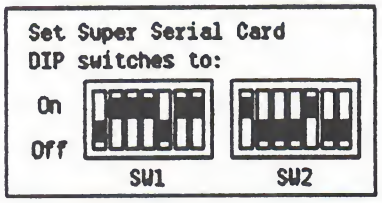
3. Connect one end (it does not matter which) of the cable you just "made" to the plotter. Secure the connection by tightening the mounting screws.

4. Connect the other end of the cable to the computer.

   Note: Apple /// - Attach it to port C.

   Note: Apple][,][+, //e - Attach it to a super-serial card with DIP switches set as seen below (See Figure 1).

FIGURE 1



When setting DIP switches on Serial Card or Plotter, the dark square shown in each diagram indicates that the switch is to be set that direction.

Example: 

indicates switches are ON

4. Connect the power cable to the plotter.

5. Plug the power cable into an AC outlet.

Setting the DIP switches

The plotter is capable of communicating with a large number of computers. Within the RS232 standard there are variations of signal format and transmission speed, to suit different machine-to-machine communication requirements. The interface setting switches allow you to define the RS232 input.

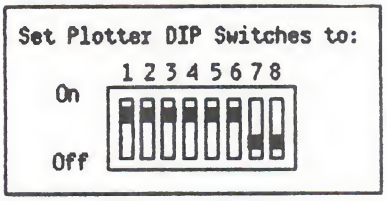
The interface setting switches are on the back panel of the plotter.

Apple Computers communicate with the plotter via an RS232 interface that is configured as follows:

- 7 bits
- No parity selected
- 2 stop bits
- 1200 baud

Generally the settings for the plotter, when communicating with an Apple, should be as shown in Figure 2, below.

FIGURE 2



When setting DIP switches on Serial Card or Plotter, the dark square shown in each diagram indicates that the switch is to be set that direction.

Example: 

indicates switches are *ON*

For computers which do not follow this particular RS232 interface requirement, look at the table below. (See Figure 3.)

FIGURE 3

Plotter Interface DIP Switch Settings

1	2	3	4	5	6	7	8	
					OFF	OFF	OFF	75 BAUD
					OFF	OFF	ON	150 BAUD
					OFF	ON	OFF	300 BAUD
					OFF	ON	ON	600 BAUD
					ON	OFF	OFF	1200 BAUD
					ON	OFF	ON	2400 BAUD
					ON	ON	OFF	4800 BAUD
					ON	ON	ON	9600 BAUD
			OFF	OFF				2 STOP BITS
			ON	OFF				1.5 STOP BITS
			OFF	ON				1 STOP BIT
			ON	ON				INVALID
		OFF						EVEN PARITY
		ON						ODD PARITY
	OFF							PARITY
	ON							NO PARITY
OFF								8 BITS
ON								7 BITS

Load Pens

Please note: If these instructions are not sufficient, a more detailed explanation can be found in the "Pens and Paper" chapter in the User's Guide.

1. Remove the pen holder from the pen carriage by pulling it towards you by the light colored plastic.

2. The pen holder has the numbers 1 through 4 on the front. Load the holder with the following pen/number combinations: black/1; red/2; green/3; blue/4.

3. Install the holder in the pen carriage. (Slide the pen holder onto the hub of the (black) carriage head until it snaps into place.)

   NOTE: The holder will only fit one way.

Load Paper

Please note: If these instructions are not sufficient, more detailed explanations can be found in the "Pens and Paper" chapter in the User's Guide.

Set paper width

1. Push pen carriage to the left.

2. Pull the light colored arm of the right feed roller horizontally toward you and slide the feed roller mechanism sideways to the right as far as it will go.

3. Slide a piece of 8 1/2 by 11 inch paper lengthwise on the front deck of the plotter in the position to be fed in, with its left edge about 6 mm (1/4") from the left wall of the plotter.

4. Pull the light colored arm of the right feed roller horizontally toward you and slide the feed roller mechanism sideways to the left until it is well over the right edge of the paper. The paper should not run into the arm itself.

5. Release the arm, then move the arm and feed roller to the right a short distance until it clicks into a notch.

   Note: The feed roller will not drop down enough to grip the paper until it clicks into a notch.

Insert paper

6. Slide a sheet of paper under the metal tabs until it will go no further. Make the paper align with the line at the left of the paper table, marked "paper side."

7. Depress the paper feed knob on the right of the plotter, and turn it clockwise. You may have to push the paper a bit before it catches.

   Paper is properly inserted when the top edge reaches the marks half way up the paper table.

   If the paper is not properly aligned (straight), remove it and try again.

Testing Computer/Plotter Communication

For the Apple ///

1. Turn on the plotter.
2. Press LOCAL on the plotter keyboard.
3. Boot the Apple][Emulation diskette.
4. Insert plotter test diskette.
5. Press RETURN. (Continue at Testing the Plotter)

For the Apple][,][+, and //e

1. Boot the plotter test diskette in disk drive 1.

Testing the plotter

Just follow the instructions on the screen.

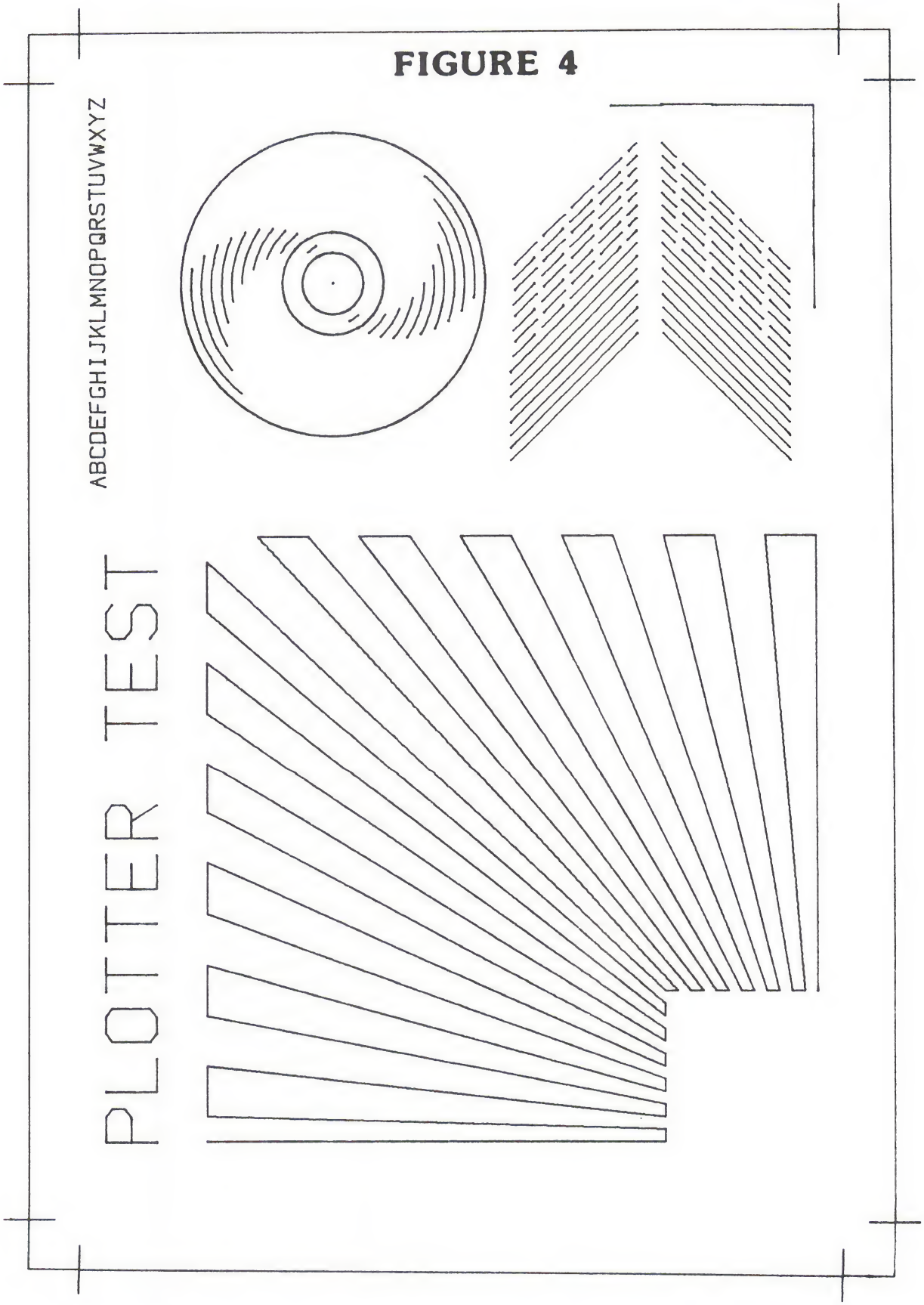
That is:

- Load the paper into the plotter. (The "size A" on the screen refers to an "A" on the plotter table, which indicates the width of the paper.)

- Press RETURN.

The plotter should now draw a test pattern. See Figure 4, on the following page, for an example.

FIGURE 4



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Apple Color Plotter Technical Procedures

Section 3

Take-apart

Contents:

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APPLE COLOR PLOTTER TAKE-APART

Introduction

These procedures are constructed so you can find the replacement or adjustment you are interested in by using the table of contents as a reference guide.

Since there is no formal training on this product, go through this entire procedure if you have not done so previously. It is probably not necessary for you to practice the soldering in the removal and replacement of the ON-OFF switch.

Be sure to:

- follow the removal procedures in the order in which they are presented. Then reassemble the plotter, in the reverse order.

- perform the adjustments when they are referred to in the replacement sections (i.e., do the solenoid adjustment as part of replacing the solenoid, and do the carriage wire adjustment when replacing the pulley motor).

- perform the carriage wire replacement. The first time it can be very tricky!

- remove and replace both motors.

Remember the following points in reading these procedures:

- Unless otherwise noted, any direction designations assume the plotter is facing you in the usual operating position.

- The adjustments are approximate. It is not necessary to measure the gaps using feeler gauges or calipers.

- **In all cases, when replacing parts or making any of the adjustments, first turn off and unplug the plotter.**

Tools Needed for All Procedures

- Medium phillips screwdriver
- Medium flat blade screwdriver
- 1.5 mm allen wrench
- 5.5 mm nutdriver
- Needlenose pliers
- Tape

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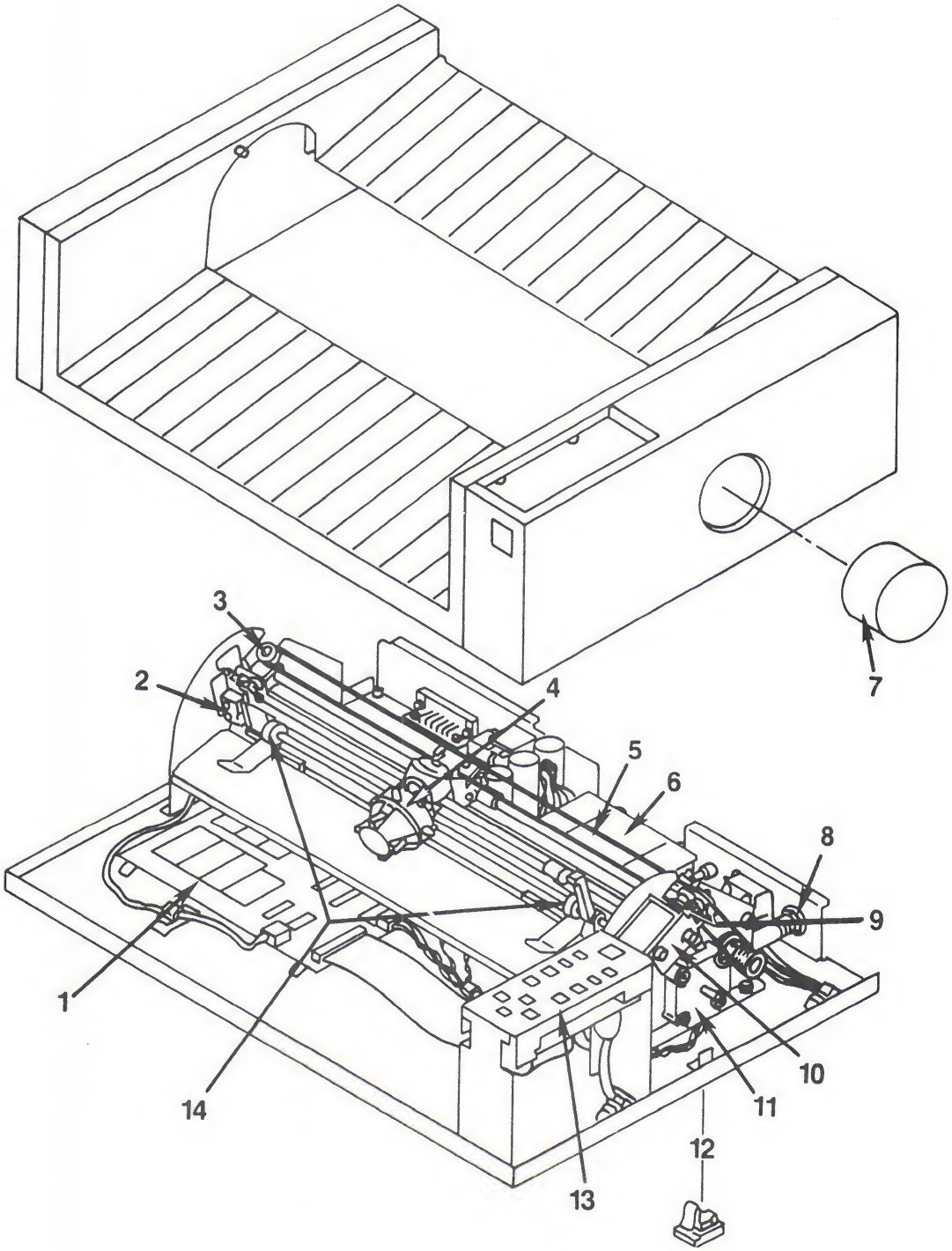
FIGURE 1



Remove Cover

1. Unplug the plotter.
2. Remove the pens from the pen carriage.
3. Turn the plotter over and set it on its top, being careful that the plastic cover remains closed.
4. Remove the black tab (Figure 1, #12) from the bottom plate of the plotter. It is located on the left side of the plotter directly over the paper feed knob (Figure 1, #7). (Little raised arrows on the tab indicate which direction to push the tab before lifting it off.)
5. To remove the paper feed knob, loosen the two set screws on the knob shaft by inserting the allen wrench in the hole made by the removal of the black tab (Figure 1, #12). (Push knob in to turn shaft.) Pull the knob free.
6. Remove the four phillips head screws from the bottom plate.
7. Set the plotter on its feet.
8. Lift the cover free.

Replace Cover

First check that all five connectors are in place with the cables in the clamps. Check that the carriage wire is wound correctly and sitting in the pulley guides.

1. Place the cover on the base.
2. Turn the plotter over and set it on its top, being careful that the plastic cover remains closed.
3. Replace the paper-feed knob and tighten the set screws.
4. Reinsert the black tab on the bottom plate.

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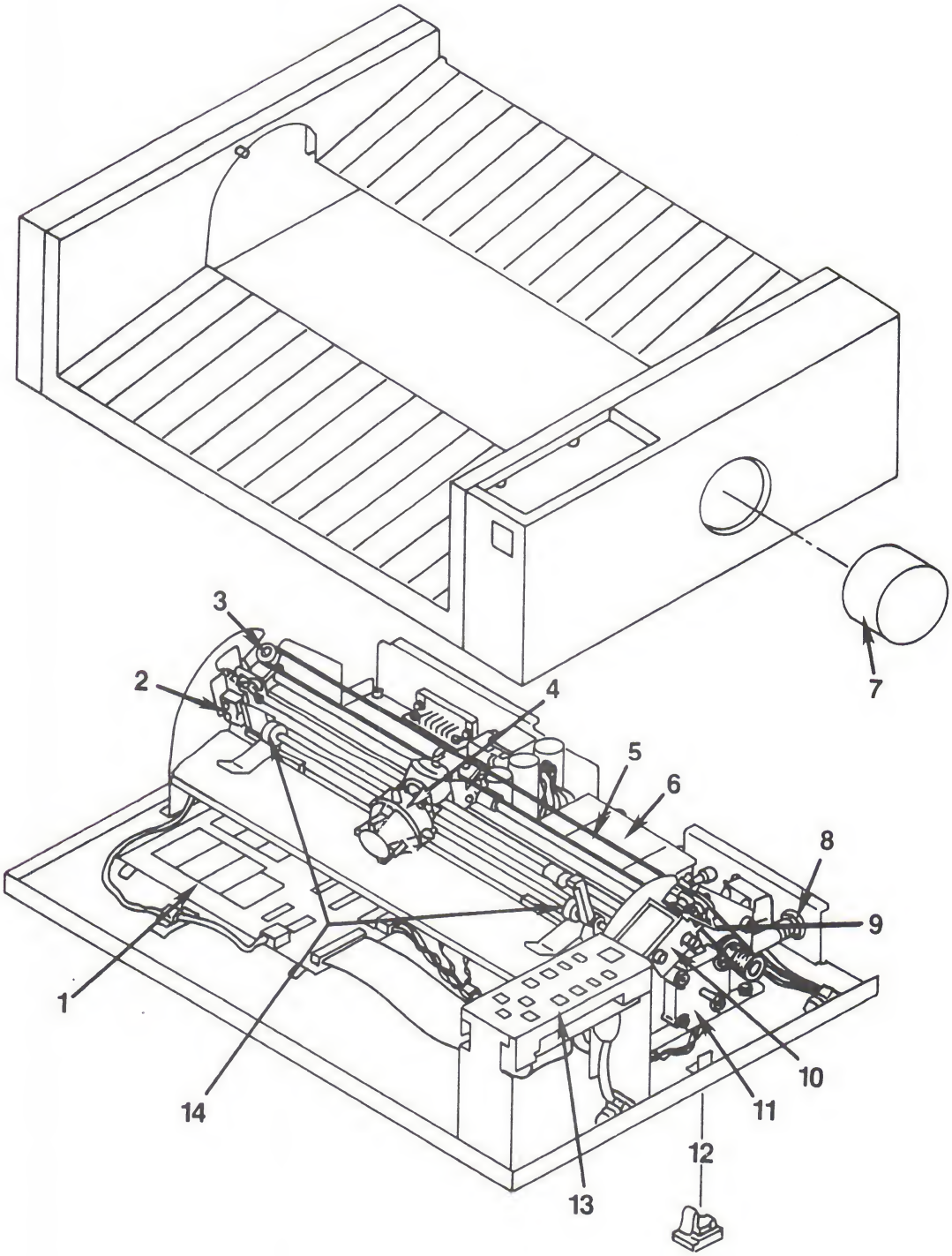
FIGURE 2



Remove Carriage/Bed Assembly

1. Remove cover.
2. Remove the four phillips head screws, two from either side of the carriage/bed assembly.
3. Disconnect the four cables (all except the transformer cable) from the main PC board and from the two routing clamps which hold the cables to the base. (To release the cables push down on the outside of the clamp and pull up on the body.) You may have to lift the carriage/bed assembly to access two of the connectors.
4. Remove the carriage/bed.

Replace Carriage/Bed Assembly

1. Set the carriage/bed assembly on the base.
2. Connect the cables to the PC board. (The two motor cables are connected to the PC board under the carriage/bed assembly. The rear motor is connected at CN4. The front motor is connected at CN5. The solenoid cable is fed under the carriage/bed assembly to CN3. The home position switch is connected at CN7.) Put the cables in the two clamps which hold the cables to the base.
3. Replace the four screws.
4. Replace the cover.

Remove Main PC Board - Figure 2, #1.

1. Remove the cover.
2. Remove the carriage/bed assembly.
3. Disconnect the transformer connector.

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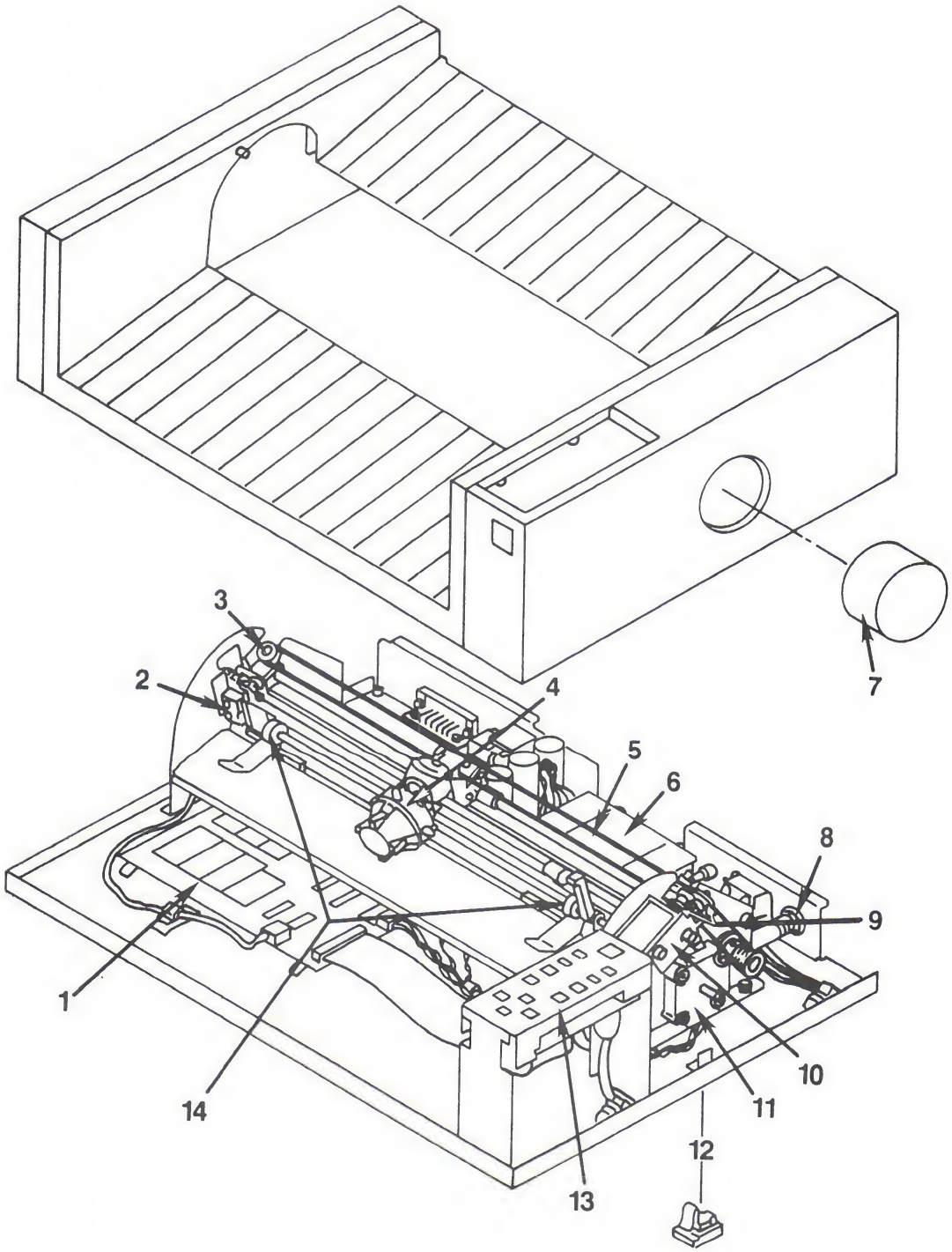
FIGURE 3



4. Disconnect the keyboard connector.

   Caution: The ribbon cable is attached by a strip connector. To remove the cable, grasp it as close to the connector as possible and pull to the right as you gently wriggle it out.

5. The PC board is attached to the base by four stand-offs and by two screws which are threaded through a bracket mounted to the back of the PC board.

   Remove the phillips screws on the far right and left sides of the PC board bracket. Push in the stand-offs and carefully lift the board from the base.

Replace Main PC Board

1. Place the PC board on the base and push down to engage the stand-offs.
2. Replace the screws.
3. Connect the transformer and keyboard connector.
4. Replace the carriage/bed assembly.
5. Replace the cover.

Remove Keyboard Assembly - Figure 3, #13.

1. Remove the cover.
2. Disconnect the ribbon cable from the main PC board.

   Caution: The ribbon cable is attached by a strip connector. To remove the cable, grasp it as close to the connector as possible and gently wriggle it out.

3. Remove the two phillips head screws which attach the keyboard assembly to the base.
4. Remove the ON/OFF switch wires from the routing clamps on the base.

5. Remove the ON/OFF switch from the keyboard assembly by removing the phillips head screw and lock washer.

Replace Keyboard Assembly

1. Place the ON/OFF switch in the new keyboard assembly. Screw in phillips head screw and lock washer to hold it in place.
2. Place the keyboard assembly on the bottom plate. Put the leads from the ON/OFF switch in the routing clamps. Tighten down the two sets of phillips head screws and lock washers.
3. Connect the ribbon cable to the main PC board.
4. Replace the cover.

Remove ON/OFF Switch

The ON/OFF switch is located on the keyboard assembly.

1. Remove the cover.
2. Disconnect the ON/OFF switch from keyboard by removing the phillips screw and lock washer from the back of the keyboard.
3. Carefully cut off the shrink tubing with an X-acto knife.
4. Use a soldering iron to remove the cables from the terminals.

Replace ON/OFF switch

1. Slide an approximately 4 cm (1 1/2 inch) piece of approximately 1.8 cm (3/4 inch) diameter shrink tubing over the leads.

   WARNING: You must replace the shrink tubing to avoid the possibility of electric shock.

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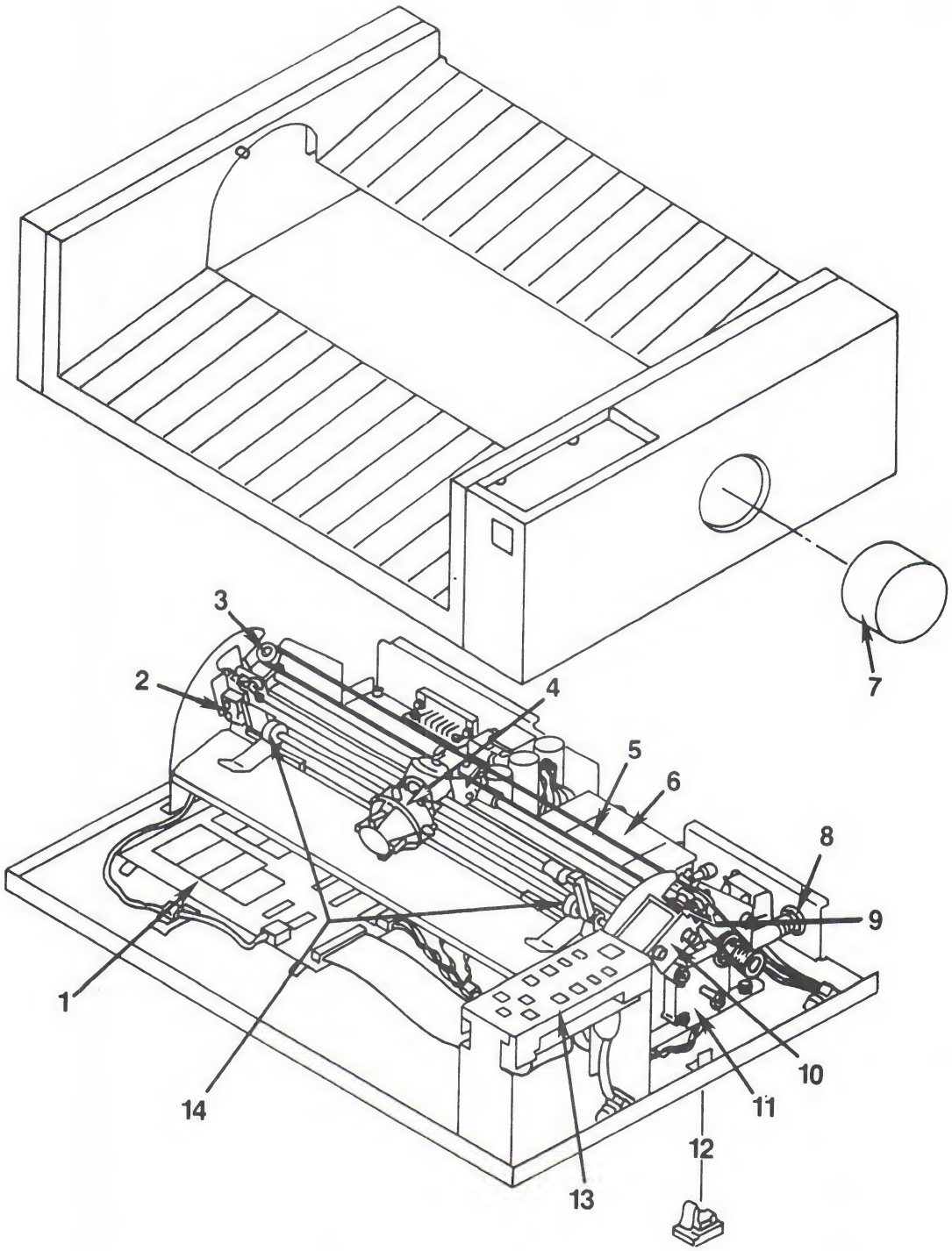
FIGURE 4



2. Solder the leads to the switch. With the switch in the installed orientation, like-colored leads should be on the same side. The thicker leads should be attached to the center terminals. The thinner leads should be attached to the bottom terminals.

3. Slide the shrink tubing up over the terminals and heat it until snug.

4. Attach the ON/OFF switch to the keyboard assembly with the phillips head screw and lock washer.

5. Push switch in and out to be sure it works and is installed properly.

6. Replace the cover.

Remove Transformer - Figure 4, #6.

1. Remove the cover.

2. Remove the carriage/bed assembly.

3. Disconnect the transformer connector from the main PC board.

4. Remove the four screws that attach the transformer to the base plate.

5. Cut the cable-tie at the AC power socket.

6. Release the wires from the routing clamps.

7. Remove the ON/OFF switch from the keyboard assembly.

8. Desolder <u>all</u> the leads from the ON/OFF switch.

   NOTE: This will allow you to install new shrink tubing.

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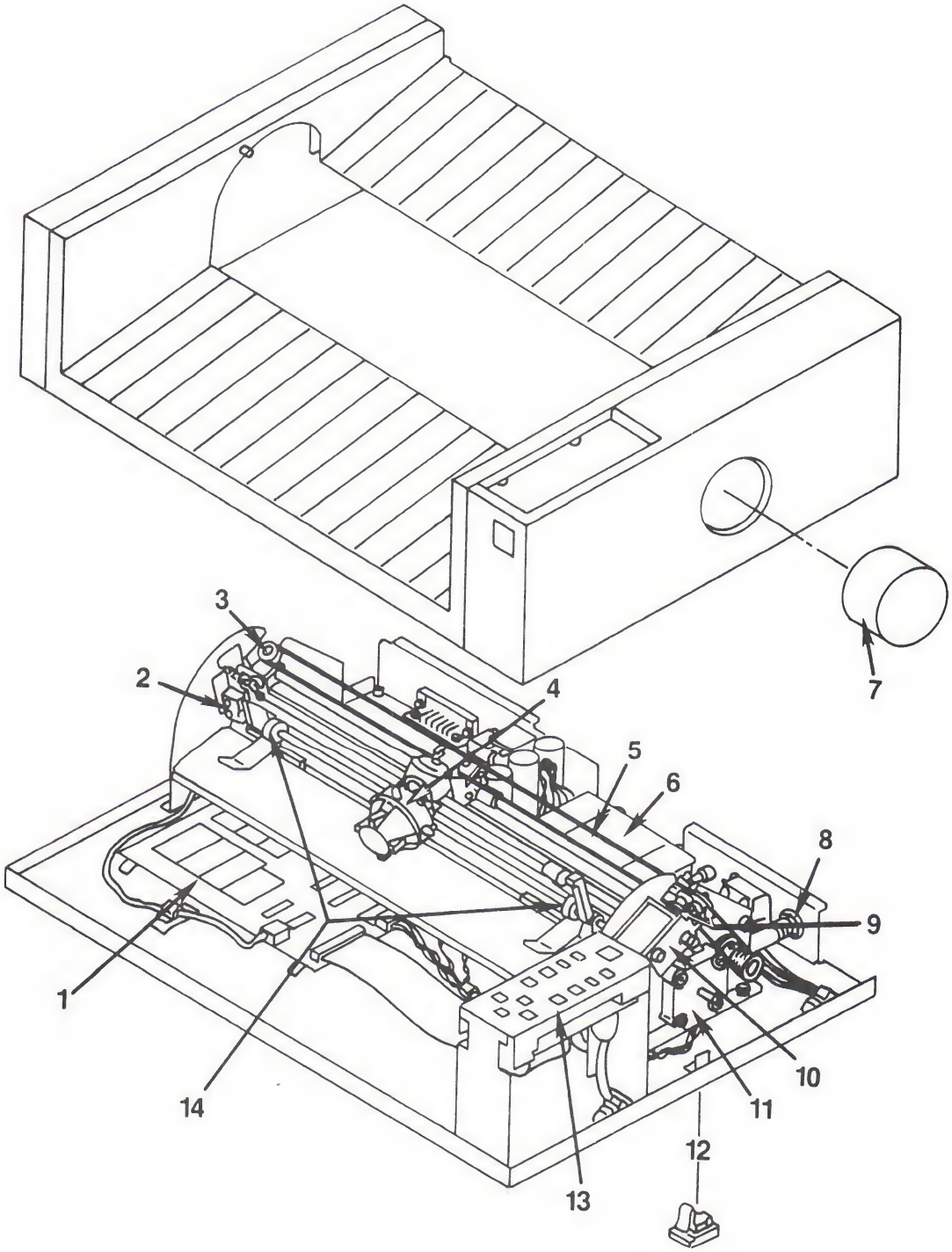
FIGURE 5



Replace Transformer

1. Slide an approximately 4 cm (1 1/2 inch) piece of approximately 1.8 cm (3/4 inch) diameter shrink tubing over the ON/OFF switch leads.

   WARNING: You must replace the shrink tubing to prevent the possibility of electric shock.

2. Solder the leads to the switch. With the switch in the correct orientation, like-colored leads should be on the same side. The thicker leads should be attached to the center terminals. The thinner leads should be attached to the bottom terminals.

3. Slide the shrink tubing up and apply heat to shrink it.

4. Replace the ON/OFF switch.

5. Wind the leads from the ON/OFF switch through the routing clamps back toward the transformer. Lock the clamps.

6. Screw down the transformer.

7. Connect the transformer connector to the main PC board.

8. Gather the AC power wires and the transformer power wires into a cable-tie.

9. Replace the carriage/bed assembly.

10. Replace the cover.

Remove Paper Feed (Roller) Motor - Figure 5, #11.

This motor is the front motor on the right end of the carriage/bed assembly

1. Remove the cover.

2. Remove the carriage/bed assembly from the base.

3. Remove the nuts from the motor using a 5.5 mm nutdriver.

4. Pull the motor out. (The roller will come with it.)

FIGURE 6

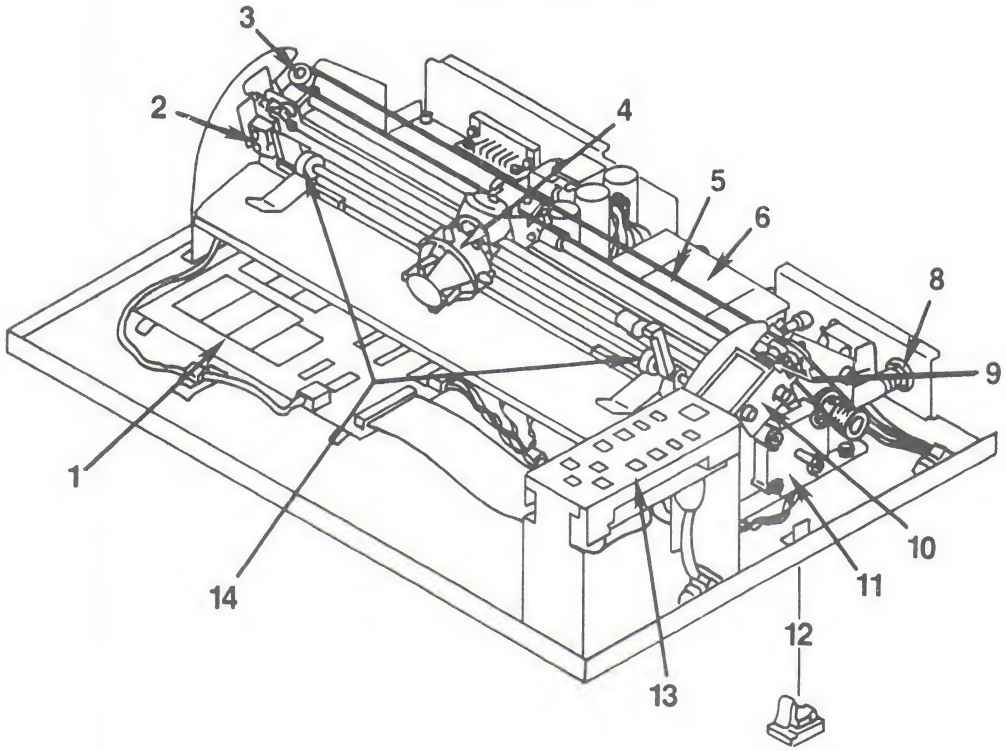
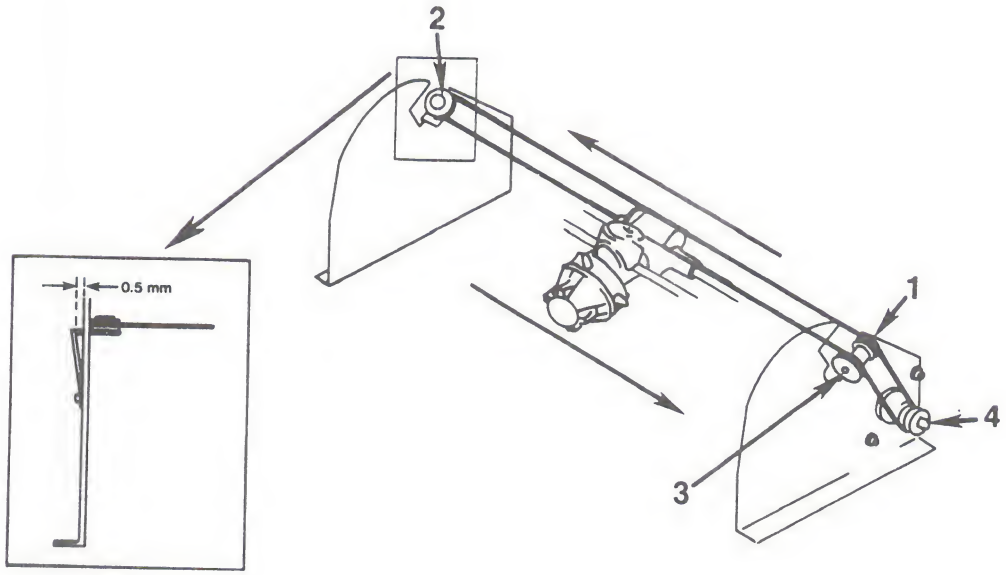


FIGURE 7



5. Use an allen wrench to loosen the set screws that attach the motor to the roller. Pull the roller and motor apart.

   Note: You may have to use a large flatblade screwdriver to separate them.

Replace Paper Feed (Roller) Motor

1. Place the new motor on the roller with a gap of approximately 1.5 mm (1/16 inch) between the roller and motor. Tighten the set screws.
2. Orient the motor so the wires exit downward.
3. Slide the roller and motor back into place. (The motor should fit snugly to the frame.) If you are having trouble, try the following:

   - Line up the motor mounting screws with the carriage bed assembly.
   - Depress the right feed roller arm and/or the left feed roller tab (Figure 6, #14) to give the roller more room to move.
   - Poke a small screwdriver through the hole in the left outside of the carriage/bed assembly to maneuver the end of the roller into place.

4. Replace the nuts, tightening alternately (the star washer goes with the top nut).
5. Replace the carriage/bed assembly.
6. Replace the cover.

Remove and Replace Left Pulley Assembly - Figure 6, #3.

The left pulley assembly attaches the left pulley to the carriage/bed assembly.

1. Put a piece of tape on the motor pulley (Figure 7, #4) so that the carriage wire will not unwind.

FIGURE 8

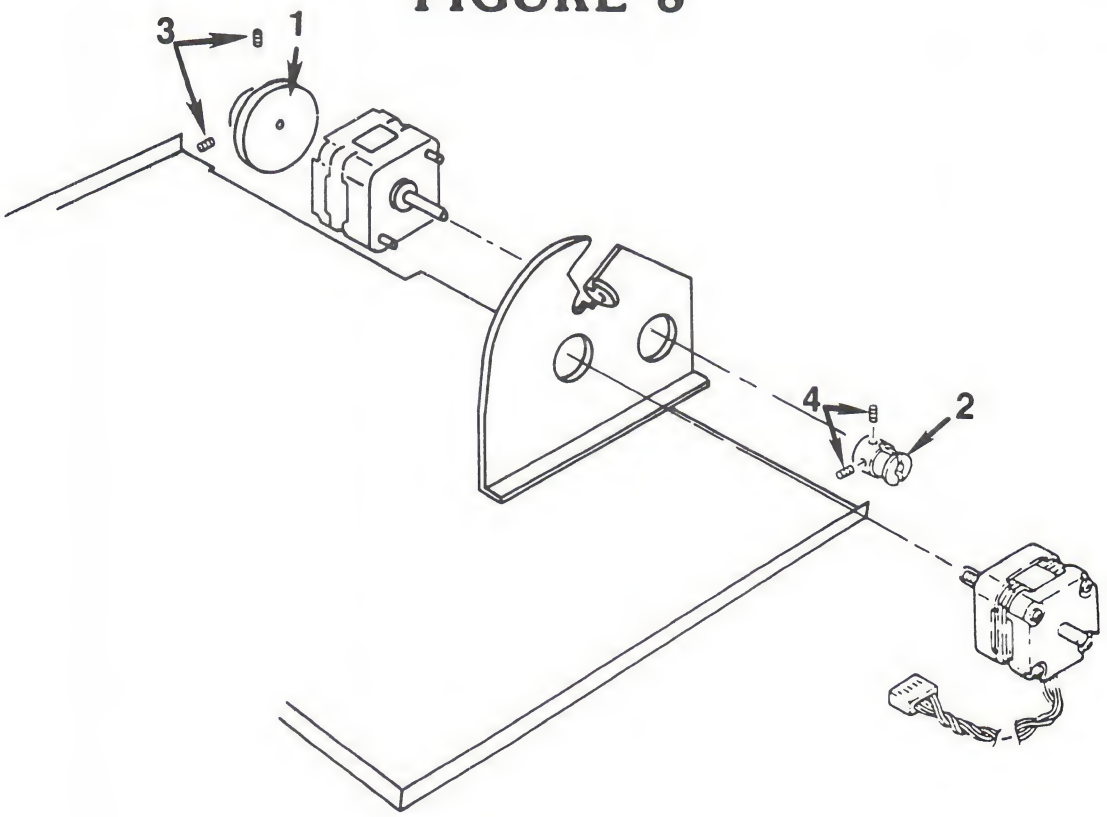
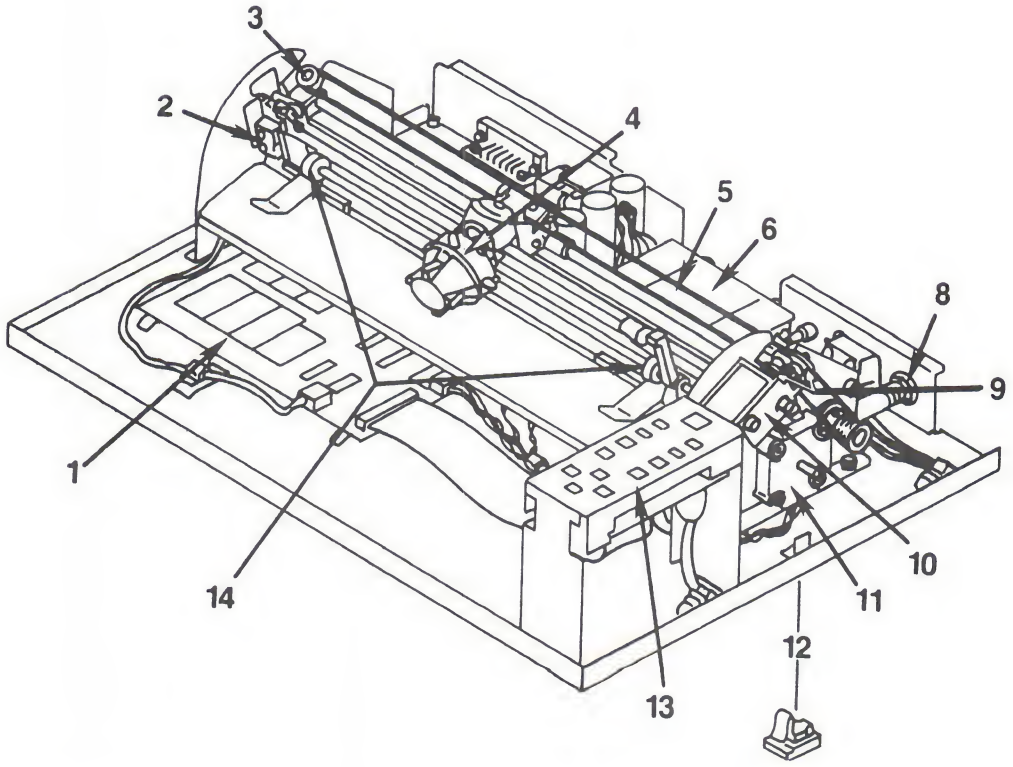


FIGURE 9



2. Remove and replace the left pulley assembly by removing and replacing the mounting screw on the bracket.

   NOTE: When in place, the pulley should be inside the frame of the carriage assembly. (See Figure 7, insert.)

3. Remove the tape from the motor pulley.

Remove Pulley Motor

This motor is the rear motor on the right end of the carriage/bed assembly.

1. To remove the flywheel (Figure 8, #1), rotate the motor pulley (Figure 8, #2) and flywheel so that the hole in the flywheel lines up with the set screws (Figure 8, #3) in the shaft. Loosen the two set screws.

2. Slide the flywheel off.

3. Slide the pen carriage (Figure 9, #4) to the middle of the carriage/bed assembly.

4. Loosen the retaining clamp screw (the easily visible phillips head screw on top of the pen carriage assembly that holds the carriage wire).

FIGURE 10

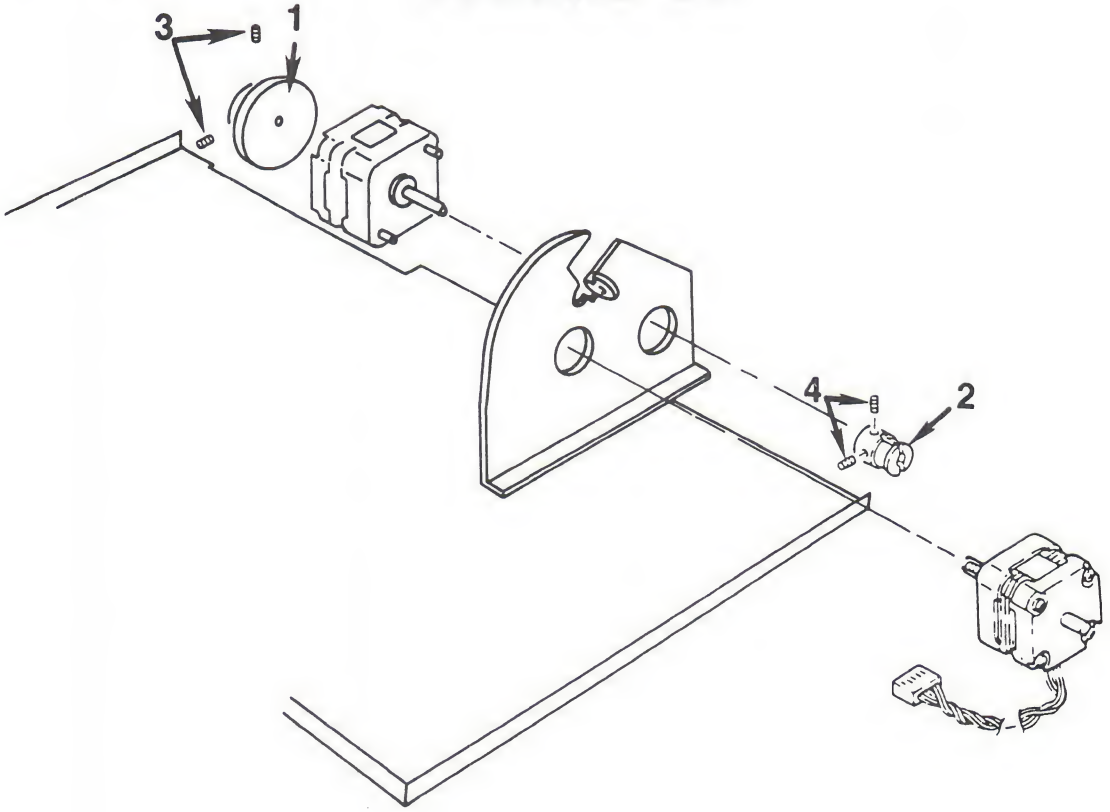
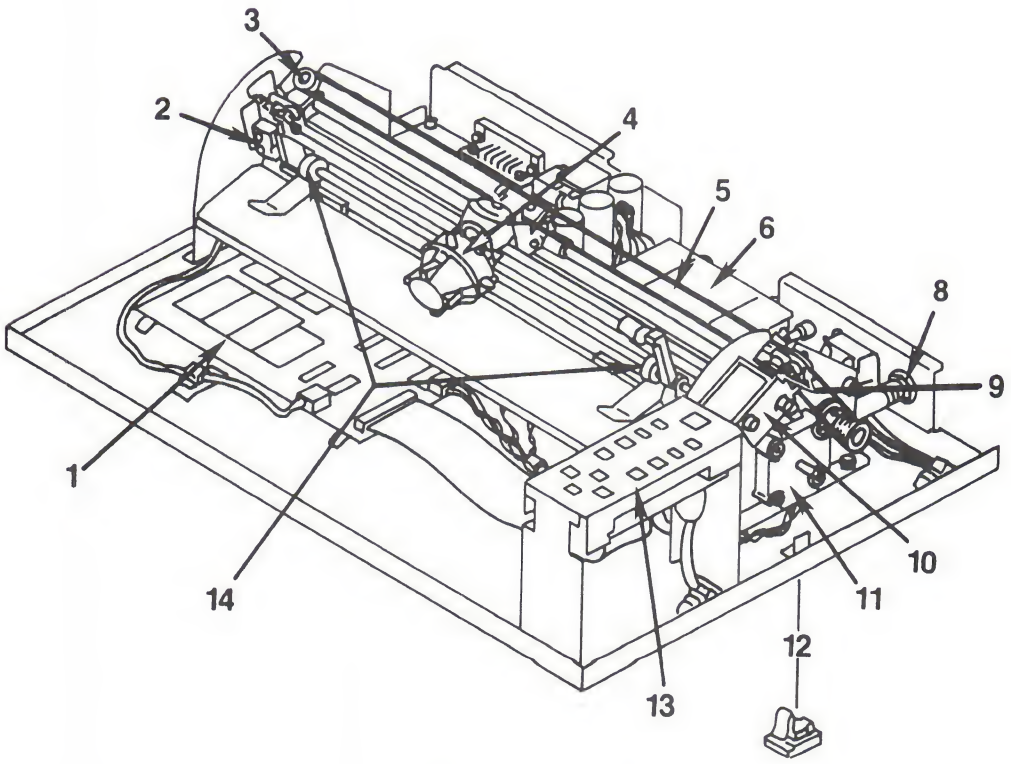


FIGURE II



5. Loosen the two set screws (Figure 10, #4) on the motor pulley.

6. To ensure the carriage wire does not unwrap during the following steps, put some tape around the wrapped wires on the motor pulley.

7. Release the carriage wire tension by loosening the nuts on the pulley motor.

8. To further release the carriage wire tension, loosen but do not remove the mounting screw for the left pulley assembly. (Figure 11, #3.)

9. Slide the wire off the left pulley assembly. Gently but firmly pull the pulley away from the pulley motor. (You may have to use a flatblade screwdriver to pry it loose.)

10. Remove the nuts from the screws that hold the motor in place.

11. Remove the motor.

FIGURE 12

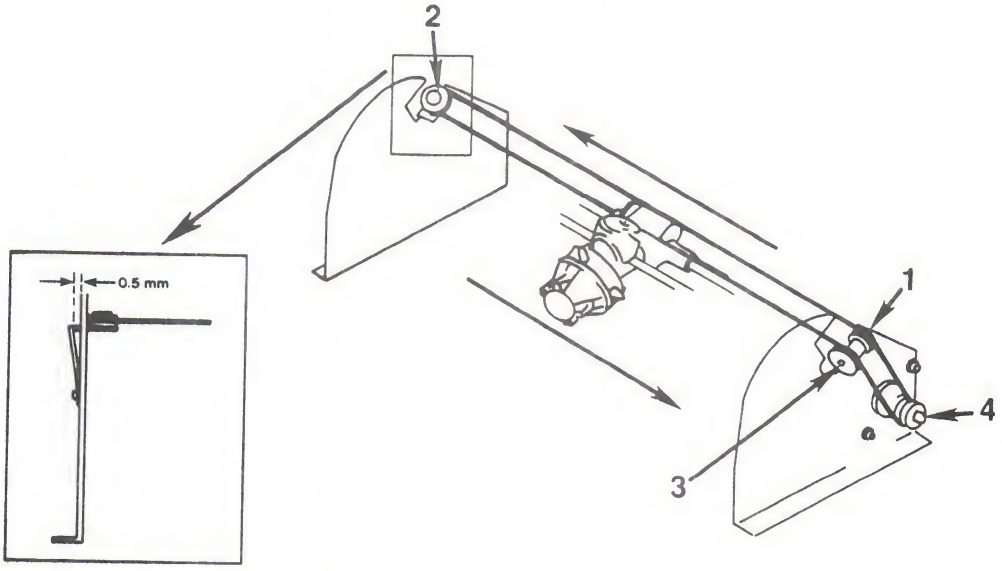
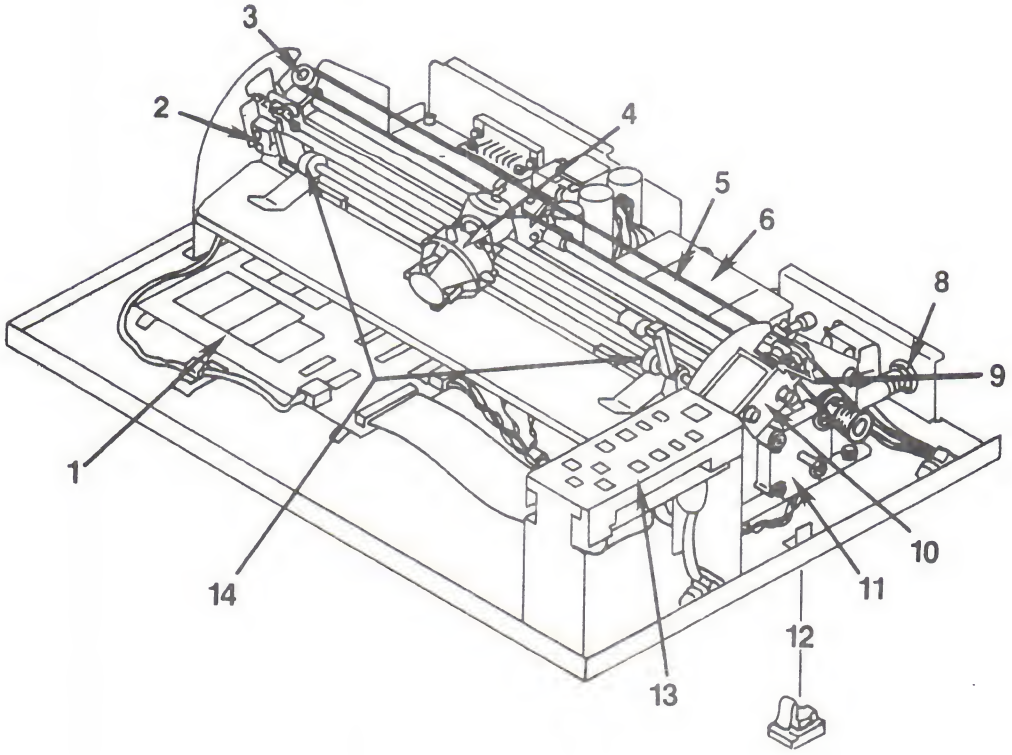


FIGURE 13



Replace Pulley Motor

1. Put the motor into place (wires exiting downward).
2. Loosely replace the nuts for the motor (star washer belongs with top nut).
3. Slide the pulley back onto the motor. There should be an approximately 1.5 mm (1/16 inch) gap between the pulley and the side of the carriage/bed assembly.
4. Slide the carriage wire back over the left pulley. Ensure that the carriage wire is correctly mounted on the guide pulleys.
5. Remove the tape from the motor pulley and tighten down the set screws.
6. Tighten the left pulley-assembly mounting screw.
7. Turn the motor pulley until it has an equal number of turns on either side of where the carriage wire leaves the motor pulley.
8. Ensure that the pen carriage is in the middle of the carriage/bed assembly.
9. Place the carriage wire under the retaining clamp on the pen carriage. Tighten the retaining clamp screw.
10. Adjust the wire tension (see Carriage Wire Adjustment section) and tighten down motor pulley nuts.
11. Replace the flywheel. There should be an approximately 3 mm (1/8 inch) gap between the flywheel and the motor. Alternately tighten the set screws until they are completely tight.

Replace Carriage Wire - Figure 13, #5.

Replace the wire if it is kinked, worn, or otherwise damaged.

1. Cut or otherwise remove the old wire.

   NOTE: Treat the new wire gently. It kinks easily.

FIGURE 14

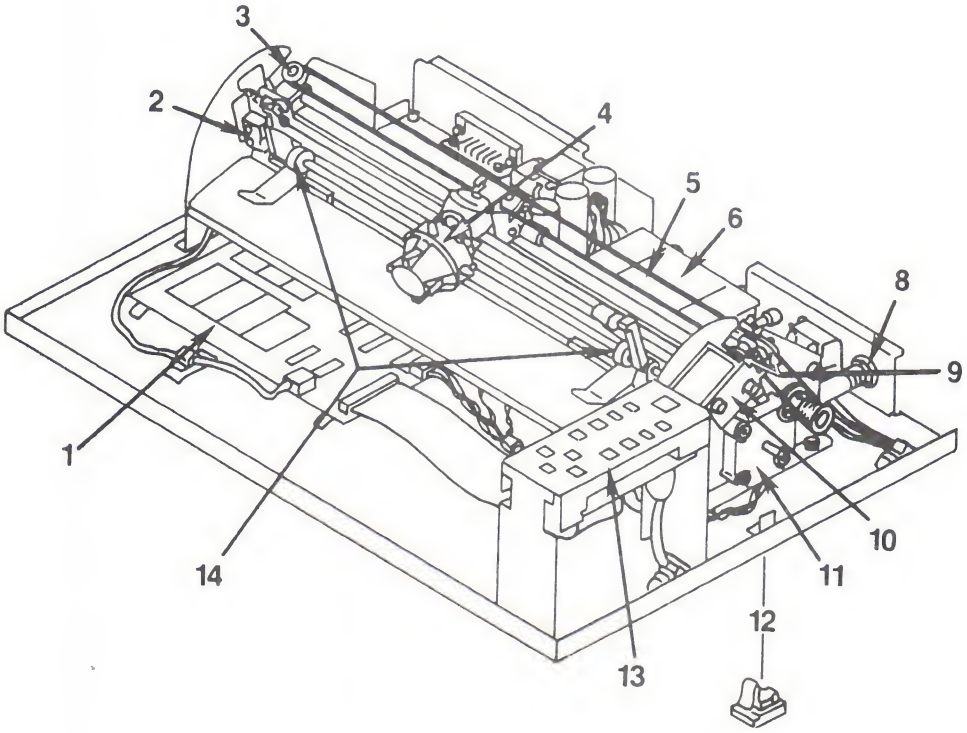
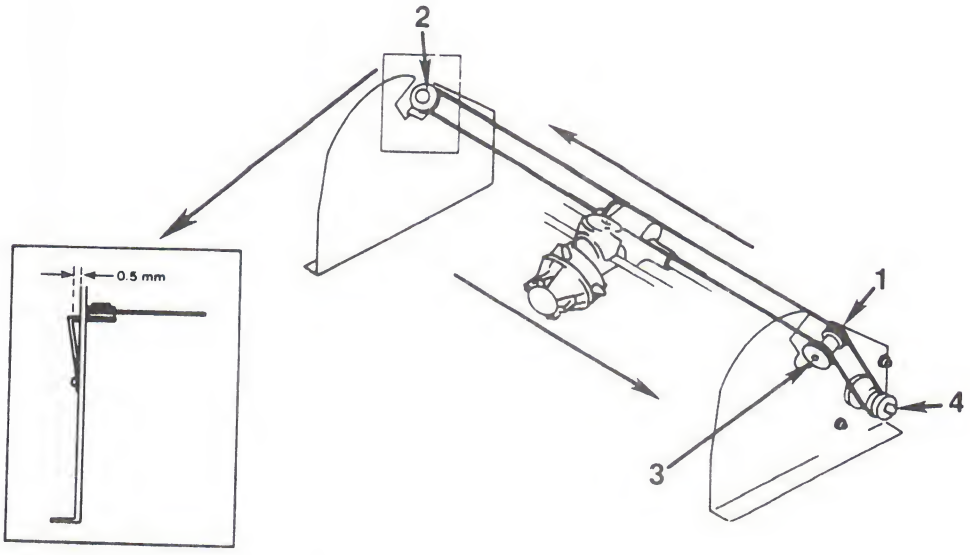


FIGURE 15



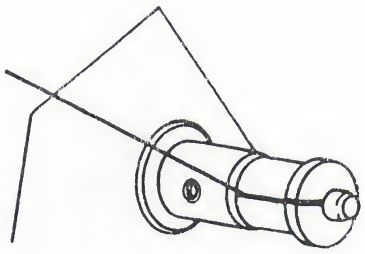
2. Loosen but do not remove the nuts on the pulley motor and the mounting screw for the left pulley assembly (Figure 14, #3).

3. Loosen the retaining clamp screw on the pen carriage (Figure 14, #4).

4. Tear off a piece of tape and leave it easily accessible.

5. There are two slots in the motor pulley (Figure 15, #4). Insert one end of the carriage wire into the long slot (Figure 16) and slide it to the inside (center) of the pulley.

FIGURE 16

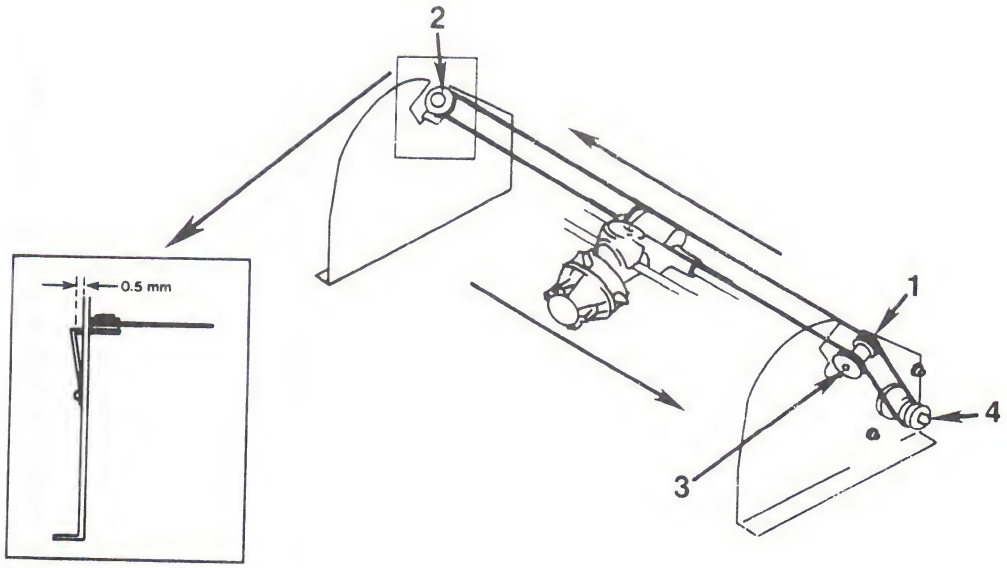


6. Keeping the wire taut, manually wind the wire onto the pulley by rotating the pulley clockwise nine revolutions.

   NOTE: Make sure the loops of the wire do not overlap.

   Once the wire is wound, hold it down with the tape.

FIGURE 17

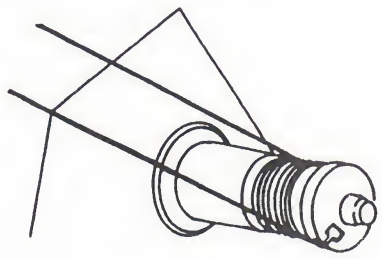


7. Thread the wire around the guide pulleys, following the arrows, in numerical order as shown in Figure 17, #1, #2, and #3.

8. Place the tape on the motor pulley so that you can access the short slot of the pulley.

9. Slip the end of the carriage wire into the short slot of the motor pulley. (See Figure 18.) This should be a tight fit. If it isn't tight, give the pulley another revolution.

FIGURE 18



(If you have trouble slipping the wire into place, remove the wire from the left guide pulley, slide the wire end into place, and then pull the wire back onto the guide pulley.)

10. Tighten the mounting screw for the left guide pulley.

11. Adjust the wire tension (see steps in the following section).

12. Remove the tape from the pulley motor.

13. Turn the motor pulley until it has an equal number of turns on either side of where the carriage wire leaves the motor pulley.

14. Slide the pen carriage to approximately the middle of the carriage/bed assembly.

15. Place the carriage wire closest to you under the retaining clamp on the pen carriage. Tighten the retaining clamp screw.

FIGURE 19

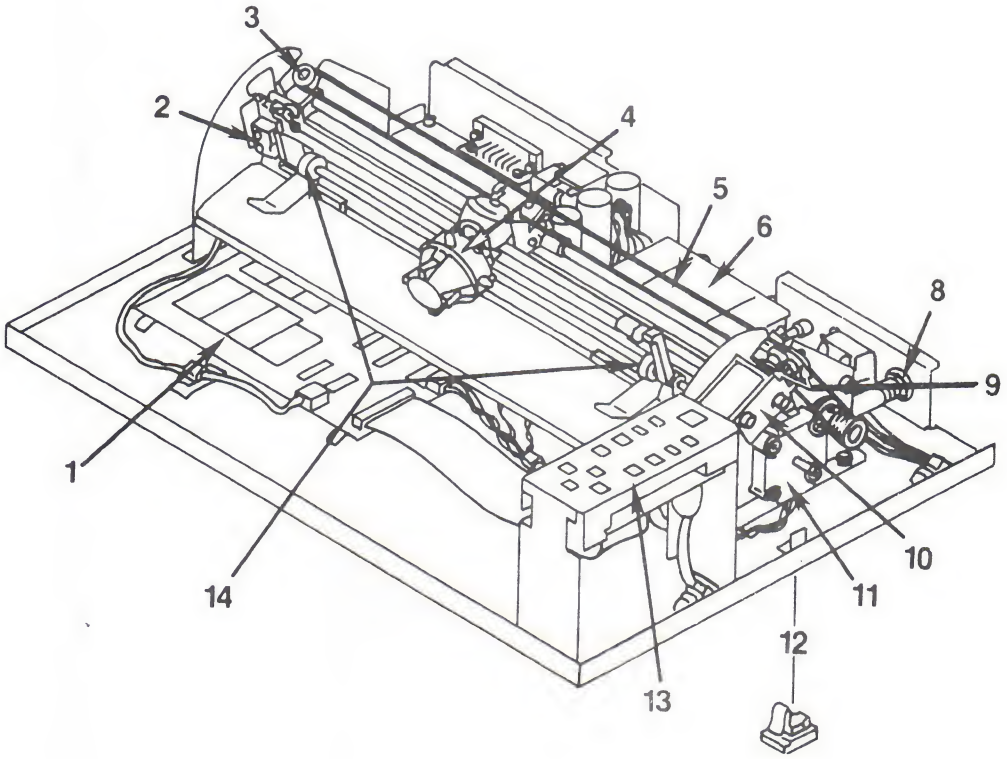
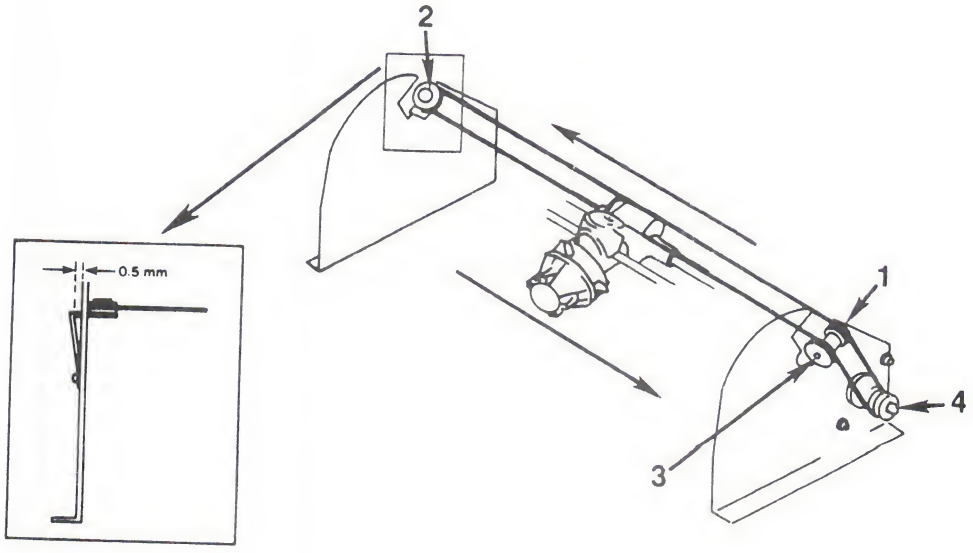


FIGURE 20



16. Slide the pen carriage back and forth to check that it can reach both ends of the carriage/bed assembly. (Note: The right feed-roller should be to the far right.)

    If the pen carriage cannot reach both ends, loosen the retaining clamp on the carriage assembly, move the pen carriage in the direction that was difficult to reach, and then tighten the retaining clamp and try it again.

Adjust Carriage Wire Tension

Read the following two paragraphs before proceeding with the numbered steps.

The carriage wire tension is adjusted by rotating the pulley motor.

The wire tension is correctly adjusted when the left pulley assembly (Figure 19, #3) is approximately 0.5 mm (1/48 inch) from the carriage/bed assembly when measured at the upper end of the left pulley assembly. (See insert, Figure 20.)

To adjust the tension:

1. Loosen the nuts which attach the pulley motor to the carriage/bed assembly.

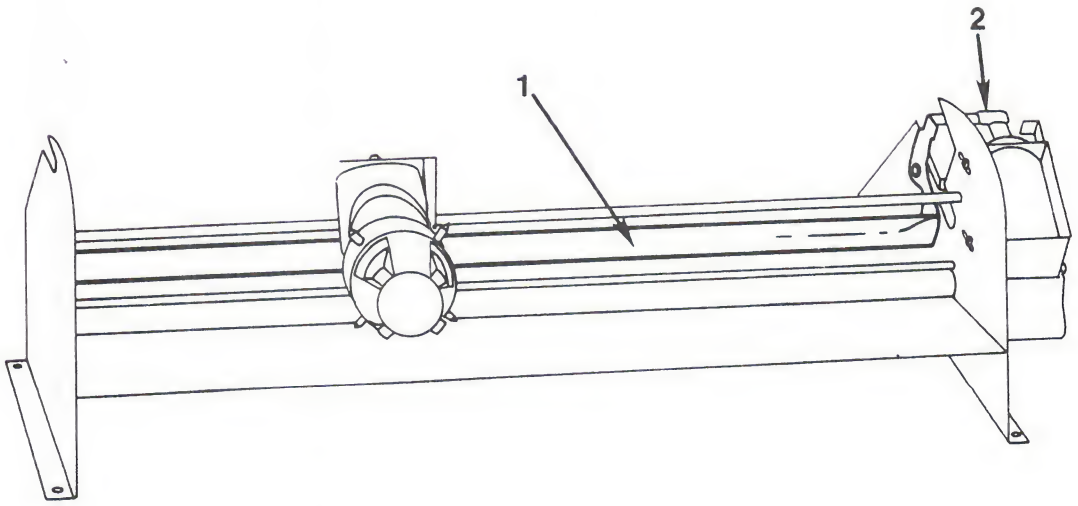
2. Adjust the carriage wire tension by rotating the motor while watching the gap at the upper end of the left pulley assembly. When the gap is approximately .5 mm (1/48 inch), tighten down the bolts.

3. Tighten the nuts when the pulley assembly is correctly adjusted.

NOTE: If you were replacing the carriage wire, return to step 12 of the Replace Carriage Wire section above and continue from there.

NOTE: If you were replacing the pulley motor, return to step 10 of Replace Pulley Motor and continue from there.

FIGURE 21



Remove and Replace Solenoid - Figure 21, #2

The solenoid moves the pen carriage up and down.

1. To remove the solenoid, remove the two screws which attach it to the carriage/bed assembly.

2. Replace the solenoid by loosely tightening the solenoid screws, adjusting the solenoid, and then tightening down the screws.

Solenoid Adjustment

Read the following paragraphs before doing the numbered steps.

The solenoid adjustment determines the pen height. In making this adjustment you are concerned with the solenoid, bail, bail lever, and pen carriage.

Look underneath the pen carriage to see where the bail (Figure 21, #1) comes into contact with the pen carriage. Push in bail lever to depress the cylinder on top of the solenoid (Figure 21, #2). Watch the bail move.

The gap between the bail and the pen carriage should be approximately 1 mm (measured when an uncapped pen is touching the platter and the solenoid cylinder is pushed in).

To adjust:

1. Put uncapped pens in pen carriage.

2. Loosen but do not remove the screws which attach the solenoid to the carriage/bed assembly.

3. Push in the solenoid cylinder by depressing the bail lever.

4. With the solenoid cylinder still depressed, guide the solenoid up and down to adjust the gap between the bail and pen carriage. Guide the solenoid up to lessen the gap.

5. When the gap is approximately 1 mm (1/24 inch) tighten the solenoid screws.

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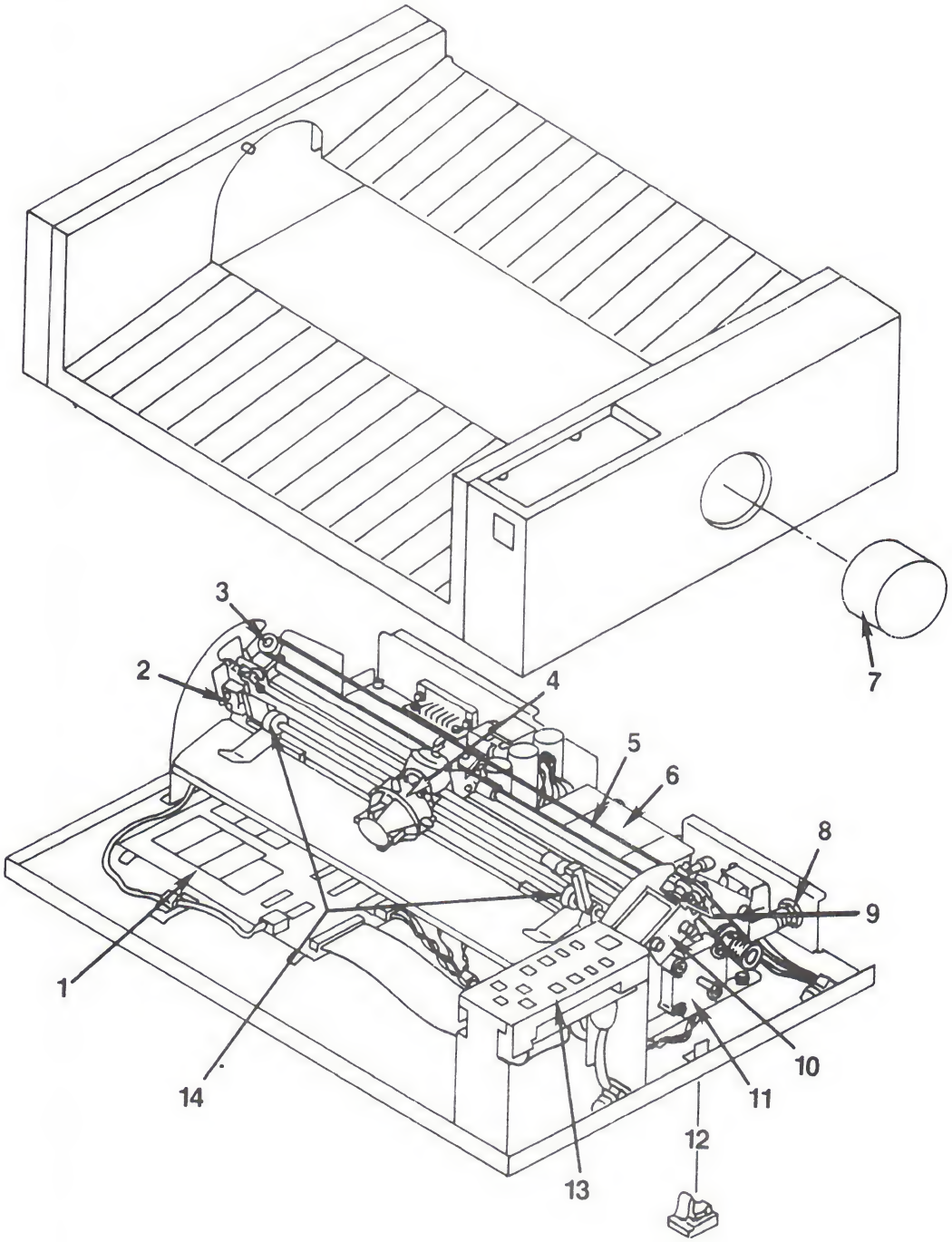
FIGURE 22



Remove and Replace Home Position Switch Assembly - Figure 22, #2.

1. Disconnect the home position switch connector (CN7) from the PC board.

2. Remove the screw and washer which hold the switch bracket in place.

3. Replace the home position switch assembly and its screw.

   NOTE: When installed, the switch and bracket should be parallel with the sides of the rectangular cut-out in the carriage/bed.

4. Feed wires back through circular hole in the left side of the carriage/bed assembly so that the connector comes out under the carriage/bed.

5. Connect the home position switch connector to the PC board.

Remove Pen Carriage Assembly - Figure 22, #4.

To remove the pen carriage assembly you will have to remove the two bars to which it is attached. Turn the plotter so that it is facing you.

To remove the rear bar:

1. Remove the pens from the carriage.

2. Put tape around the wires on the motor pulley.

3. Loosen the wire-retaining-clamp screw of the pen carriage.

4. Remove the left pulley assembly (Figure 22, #3).

5. Remove the e-clip on the far right of the bar (outside of the carriage/bed) using needlenose pliers. Slide the bar out.

FIGURE 23

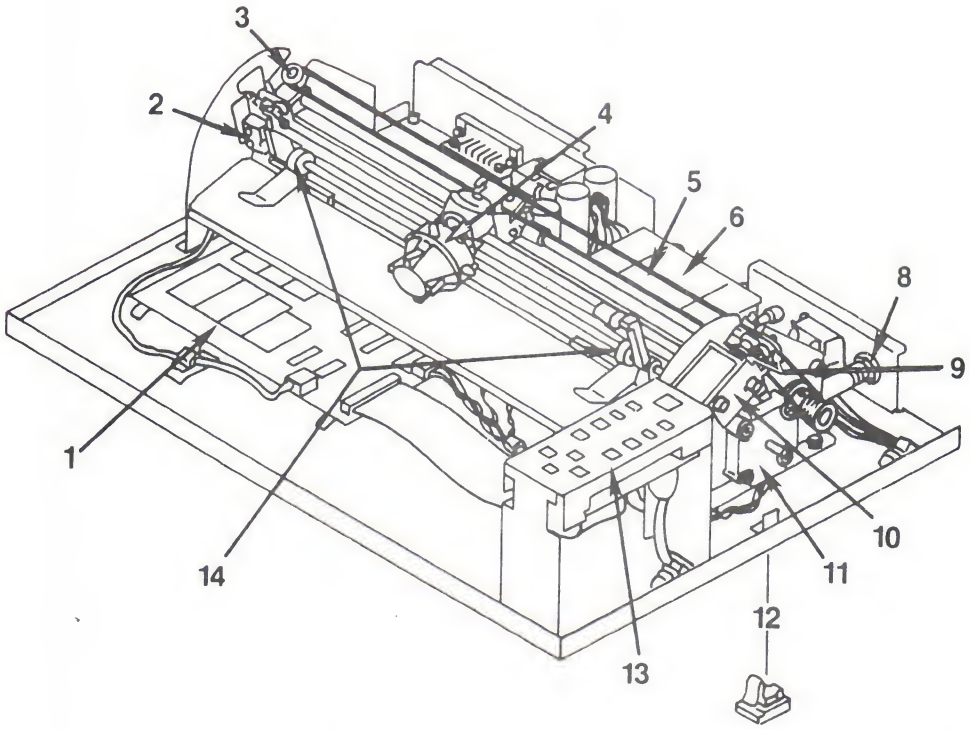
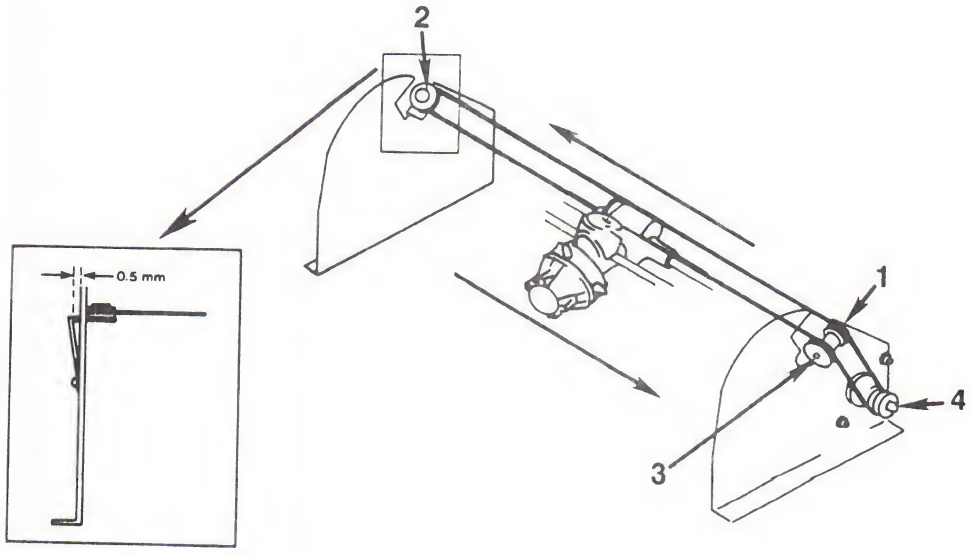


FIGURE 24



To remove the front bar:

6. Remove the screw and washer that holds in place the front bar (and the home position switch bracket [Figure 23, #2]). Pull this bar out. The pen carriage assembly is now free.

Replace Pen Carriage Assembly

1. Replace the rear bar, threading it through the pen carriage. Replace the left guide pulley. Put the e-clip in place.

2. Replace the forward bar, threading it through the pen carriage.

3. Replace the home position switch and tighten the screw.

   NOTE: When installed, the switch and bracket are parallel with the rectangular cut-out in the carriage/bed.

4. Replace the left pulley assembly.

   NOTE: When in place, the pulley should be inside the frame of the carriage assembly. (See Figure 24, insert.)

5. Put the carriage wire over the left pulley.

6. Put the carriage wire under the retaining clamp of the pen carriage and tighten the screw.

7. Check the guide pulleys (Figure 23, #3 and #9) and the motor pulley to see that the carriage wire is wound correctly.

8. Check the carriage wire tension.

Remove and Replace Fuse Figure 23, #8.

1. Use a flatblade screwdriver to turn fuse cover 1/4 turn to the left.

2. Put new fuse in cover and replace the cover.

FIGURE 25

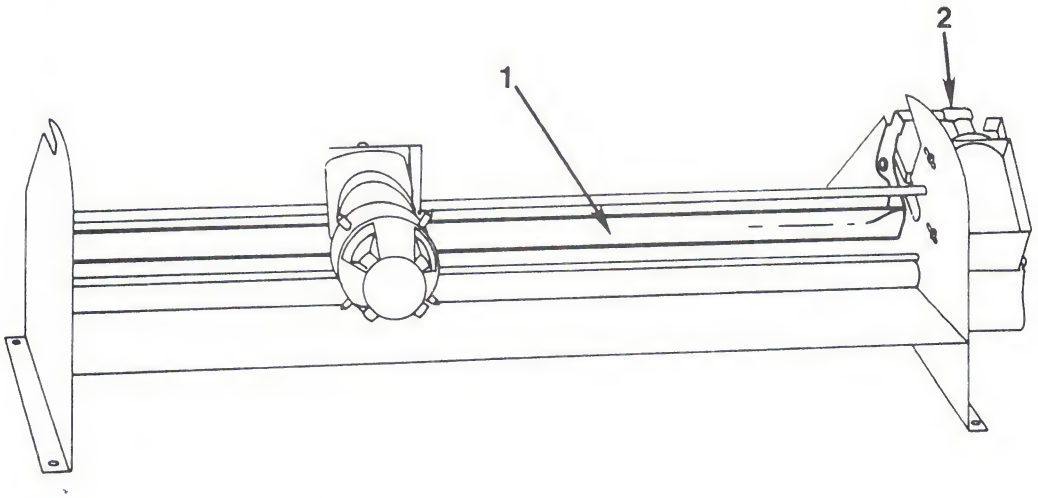
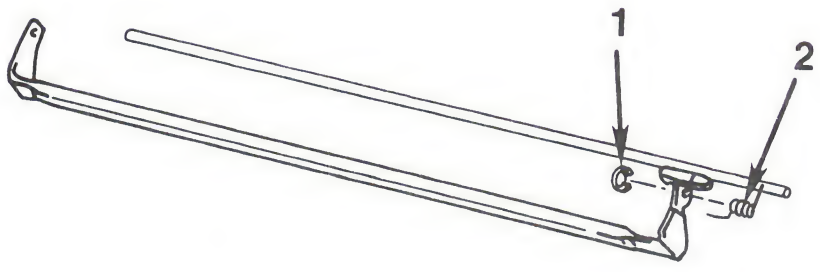


FIGURE 26



Remove Bail Spring

The bail is the rod that is moved by the solenoid (Figure 25, #1). The spring is on the far right side of the bail, inside the carriage/bed.

1. Remove the e-clip using needlenose pliers (Figure 26, #1).
2. Gently slide the bail to the left, up, and toward you so you can get at the spring.

   NOTE: Be careful. The bail is flexible and you can easily bend it out of shape.

3. Remove the spring.

Replace Bail Spring

1. Put the spring back on the assembly. The right-angle side should be to the left.
2. Replace the bail and the e-clip.
3. The straight end of the spring should lie on top of the rear bar. (See Figure 26, #2.) The right-angled side should lie on top of the bail.

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Color Plotter Technical Procedures

Section 4

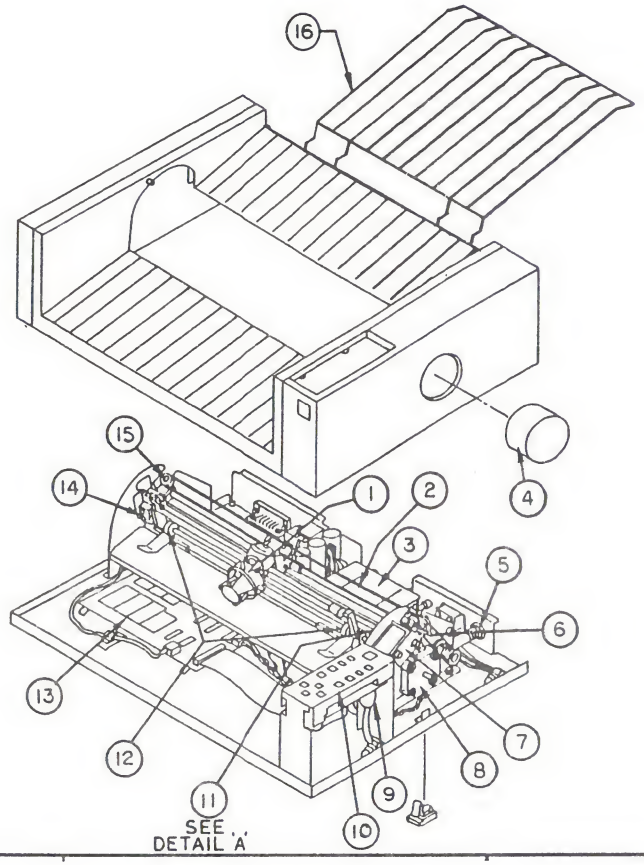
Illustrated Parts List

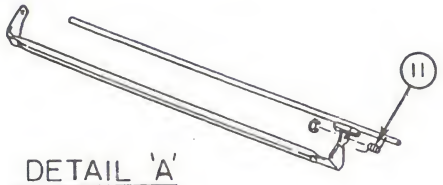
The figures and lists below include all piece parts that can be purchased separately from Apple for the Color Plotter, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

REV	ZONE	ECO #	REVISION	APPD	DATE
A		S493	INITIAL RELEASE		

NOTE: UNLESS OTHERWISE SPECIFIED





DETAIL 'A'

METRIC		apple computer inc.	
DIMENSIONS ARE IN MILLIMETERS TOLERANCES X ± — XX ± — ANGLES ± — DO NOT SCALE DRAWING		NOTICE OF PROPRIETARY PROPERTY THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING 1) TO MAINTAIN THIS DOCUMENT IN CONFIDENCE 2) NOT TO REPRODUCE OR COPY IT 3) NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART	
MATERIAL —	FINISH —		
DRFT Tom Angel	DRFT CK	TITLE ILLUSTRATED PARTS LIST COLOR PLOTTER	
ENG APPVL	MFG APPVL		
RELEASE	ORIG DIV SERVICE		
DESIGNER	SCALE N/A	SIZE B	DRAWING NUMBER 070-0225-A SHT 1/1

apple computer

Color Plotter

Item	Part No.	Description
1	970-0588	Pen/Carriage Assembly
2	970-0587	String Assembly
3	970-0583	Transformer
4	970-0597	Knob/Clutch Assembly
5	740-0203	Fuse
6	970-0596	Right Pulley Assembly
7	970-0589	Solenoid Assembly
8	970-0590	Motor Assembly
9	970-0586	AC Switch
10	970-0585	Keyboard Assembly
11	970-0593	Spring
12	970-0591	Feed Roller
13	661-95147	Color Plotter Main PCB
14	970-0592	Home Switch Assembly
15	970-0595	Left Pulley Assembly
16	919-0059	Back Paper Support